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THE COMPLETE SWIMMER



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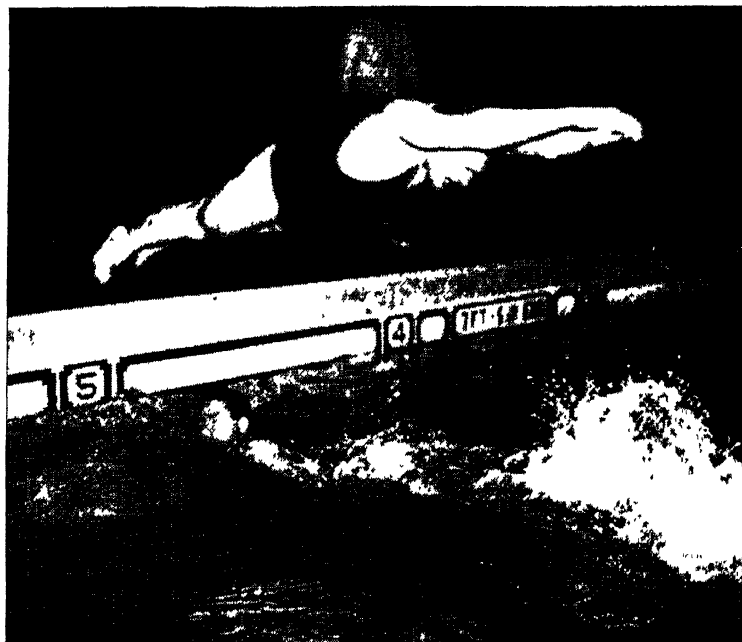


FIGURE 1. A fast racing dive in the relay event.

THE COMPLETE SWIMMER

BY

Harold S. Ulen
and
Guy Larcom, Jr.



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To
H. S. L.
The critical layman

Most of the photographic work has been done by Paul Larcom. We are particularly indebted to him for his contribution in the form of the many silhouette photographs which constitute the bulk of the instructional material. Thanks are due to Marshall Joyce for the diving sketches and to Richard D. Walker, Jr., Al Sinnott and others for additional photographs.

Introduction

THIS BOOK ASSUMES that almost everyone can swim comfortably if not rapidly. Swimming is, after all, merely the art of adapting man's body to use in the water. Man may lack the buoyancy of a duck, the fins, gills and the tail of a fish, the webbed feet of a frog; but he has intelligence, imagination, and ingenuity to compensate for these physical limitations in the water.

Further, it is no longer necessary for a beginner to flounder about in search of a suitable stroke, as his ancestors undoubtedly did. History indicates how, through years of experience, man gathered knowledge of locomotion in the water. A potential swimmer today finds at hand an array of excellent strokes and dives and easy methods of learning them.

This book is planned to guide the beginner to increased competence and finally to success in competition. He is encouraged to set no limits to progress, to go as far as physical ability permits. Those who swim poorly are advised to check the details of their strokes and make changes that will enable them to swim farther and faster. Others can expand their general ability in the water by learning a number of strokes—choosing from the crawl, back crawl,

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breast stroke, butterfly stroke, side stroke, and trudgen—or by branching out into the diving field.

Movements in the strokes and dives are relatively simple: it is the ability to make the body perform them correctly that is difficult. When carefully illustrated, the crawl arm stroke, for example, appears to be and really is a natural, easy motion; yet at the first attempt it invariably seems awkward. The swimmer, then, has to study a stroke thoroughly and repeat its motions until the muscles learn their new duties and the arms, legs, and head move as if in grooves. For this reason, distance swimming is emphasized in the chapters to follow.

Probably the best quality any prospective swimmer can have is a healthy curiosity. He has a body with arms, legs, a short neck, a considerable amount of strength, a special type of breathing apparatus, and a certain amount of buoyancy. How well can it be made to perform in the water? This book was written to provoke such a curiosity concerning man's aquatic ability and to suggest ways of satisfying it.

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Swimmers of the Past

HISTORY HAS LITTLE to say about the pioneer of all swimmers, yet a study of his primitive life and simple motivations suggests that early swimming was occasioned primarily by necessity. To flee across an unfordable stream or lake from enemies or carnivorous animals, to search among the plant and marine life of lake, shore, and river for easily obtainable and succulent food, to bask in warm waters washing away a certain amount of primeval ooze—these may have been the motives that brought man close to the water and resulted in his learning to swim.

Imagine how crude that early stroke was! Knowing nothing about the water, without precedent, and with only instinct to guide him, man's first efforts must have been comic. Yet out of the welter of splashing and grunting something did emerge: a human being swimming slowly with arms circling under the chin in a motion resembling what is now loosely termed the "dog-paddle," with hairy legs alternately bending and snapping downward from the knee, pressing the shin and top of the foot against the water. It is the stroke often considered most natural to man, the one which beginners seem to find easiest. A famous authority on the history of swimming has named it well—the "human stroke."

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Early records of swimming, the Assyrian bas-reliefs in the British Museum, indicate that the popular stroke in the year 880 B.C. was an overarm stroke bearing a close resemblance to what is now called the crawl stroke. The swimmers are in a prone position, bodies slightly arched, one arm reaching out over the water, one pulling underneath, legs bent at the knees at varying angles. Their kick was an up-and-down leg thrash.

Swimming was a familiar activity in civilized Assyria, yet it seems to have been associated mainly with transportation and war. It furnished motive power for cumbersome boats, and in times of combat enabled soldiers to move swiftly toward or away from the enemy. They used a curious affair called a *mussuk*, an inflated goatskin, for increased buoyancy, yet there are many instances of men propelling themselves without this aid. Their stroke seems to have been powerful and swift, and because they did so much swimming it is not unreasonable to conjecture that they enjoyed it.

The Greeks and Romans, physically active races, found swimming a necessity in war, as did the Assyrians and primitive man, and a refreshing and healthy form of recreation in time of peace. The Romans loved to cleanse and rest their bodies in their large resplendent baths. They taught their youth to swim; indeed, swimming must have been of major importance to them, to judge from the following criticism of an uneducated man: *Neque literas neque natare didicit* (He learned neither to read nor to swim). Their stroke is curiously like that of the Assyrians, indeed so similar that it may have been derived from it. The coin of Abydos, A.D. 193, shows Leander swimming the Hellespont with a crawl stroke that is, if anything, even better

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than that of the Assyrians. His head is held a bit too high—perhaps to enable him to see Hero guiding his way with a lighted lamp from the tower—but if his leg motion was not the flutter kick used today, it closely resembled it.

The Middle Ages retarded swimming as they did the arts in general, and until the Renaissance evidences of man swimming for necessity or pleasure are few. The return of the sport to the popularity of the Greco-Roman and Assyrian eras was evidently not to be for a long time. The good strokes of those early days were neglected on the Continent—to judge from the records—until the latter part of the nineteenth century. The arm-over-arm style, generally thought to be the best stroke of all and a favorite in the years B.C., did not return to popularity in Europe until the nineteenth century, and then by way of persons who had learned it from South Sea natives. For a long time the Europeans fumbled with the less ambitious side stroke or breast stroke, where the arms move safely and easily under water, and there is little splashing and watery turmoil. Yet swimming never vanished entirely from Europe. Early British literature, notably the epic “Beowulf,” contains boasting references to it and cites unbelievable exploits in the water suggesting that the Scandinavians were hardy watermen as well as hardy seamen. Yet the waters flow cold in those sections, and swimming was more likely to serve for demonstrating physical prowess than for any other purpose. How they swam when they performed so remarkably is difficult to say; but if their strokes were like those of the Germanic tribes they probably used a strong breast stroke which enabled them to carry weapons and armor.

At a time when the white man was still toying gingerly with his side stroke and breast stroke, the North Ameri-

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can Indian swam a bold and vigorous overarm stroke with a hard up-and-down continuous leg thrash. How effective this stroke was, we do not know, although a London paper of 1844 describes Indians swimming for a silver medal presented by the National or British Swimming Society. Flying Gull beat Tobacco, swimming the length of the bath, 130 feet, in less than half a minute. "Their style of swimming is totally un-European," the paper states. "They lash the water violently with their arms, like the sails of a windmill, and beat downwards with their feet, blowing with force and forming grotesque antics." About fifty years later another commentator states, "The Indian, the Payton, and the Trudgen have completely demoralized Londoners as swimmers." All three strokes were overarm, differing essentially in the kick. The trudgen and Payton involved a thrust or scissors kick, the Indian presumably a beating movement of the whole leg.

After 1500 swimming entered a long period of the most gradual progress on the Continent and finally in America culminated in the improved technique of today. If, for example, today's swimmer had been swimming down through these years, he would have seen methods tried and discarded, notions and superstitions disproved by the test of experience, stroking modeled upon various patterns—some bad, some good. He would have been learning swimming the hard way. The literature of the sport is full of material ranging from wild guesses to remarkable truths, and we must assume that the attitude and knowledge of the swimmers roughly paralleled that of these writers.

The Europeans at first developed a form of the breast stroke rather than the human stroke. Its origin may be as

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simple as this: A person who unexpectedly falls into deep water instinctively tries to support himself with one of two types of movements. He might paddle with his arms and hands and move his legs as if running. This would lead to the "human stroke." On the other hand, the arms might be sculled in circles, palms parallel with the surface and pressing downward, the legs also moving in circles. If the person tried to make shore still moving in this fashion, the body might level off somewhat, the arms reach forward a little more; and a stroke bearing a faint resemblance to the breast stroke would result.

Although the average swimmer, before 1800, may have swum a dubious breast stroke, there were undoubtedly venturesome fellows like Benjamin Franklin who not only swam well but expounded certain theories on swimming which were quite sound. There were few Franklins, however, and in the nineteenth century, when swimming really began to be accepted as a form of recreation, swimming authorities were stating that the "art is still lamentably circumscribed." Yet, swimming was really getting somewhere. Individuals such as William Wilson were writing, "The experienced swimmer when in the water may be classed among the happiest of mortals in the happiest of moods, and in the most complete enjoyment of the most delightful of exercises." Competitive swimming and the search for speed yielded first the side stroke—an offshoot of the breast stroke—then an awkward overarm with the "human" or the breast-stroke kick, then with a scissors kick as in the trudgen, and finally the first efforts at the continuous leg thrash.

When the Americans took up the sport around the turn of the century prospects became brighter than ever. Facil-

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ities were being expanded and improved, and the lessons and enthusiasm of the competitors were gradually transmitted to the multitudes that knew so little about the sport. The nineteenth century British swimming masters were pompous, affected fellows—as well they might be, considering their pioneering in this sport—but they taught thousands to swim.

There was a lot that the swimmer was learning during this rapid nineteenth and early twentieth century metamorphosis. Gradually his distrust of the water and his indifference were being broken down. The newer and better strokes, the cleaner pools and baths, the increasing interest of his fellow men, the insistence of some authorities that there was health and strength in swimming, all helped to change the general attitude. Yet customs such as overdressing and refusing to expose the limbs to sun and water had to be defeated, and the masses still had to be won. It was from 1900 to the present that swimming was to come into its own as a sport and, more important, as a form of recreation.

The beginning of competition in the middle of the last century and its growth have led swimming to newer and better developments. Once the Americans began to race in the water, modifications in the trudgen and Australian crawl came quickly until suddenly the American crawl with its rhythm, its speed and flexibility became popular. The breast stroke was continued as a competitive stroke, and in the process of being speeded up assumed more grace. The back stroke, hitherto virtually nonexistent, came into being as a fast and handy stroke. The impetus of competitive swimming was conveyed to the public, and soon these new strokes were entering into general use.

Swimmers of the Past

Thus splashing down through the years, primitive man and such civilized nations as the Assyrians learned from necessity to swim; the Greeks and Romans became aware that swimming had value as a healthy, educational pastime; and the English and Americans cultivated it as a competitive sport and as a form of recreation.

The obstacles to swimming in the past teach the swimmer to appreciate today's facilities, the large clean indoor and outdoor pools, the countless well guarded lakes and beaches, the careful precautions to prevent accidents, the supply of good coaches and instructors, and the attractive bathing suits that permit free movement in the water. Furthermore, he has the benefit of the experimentation with the various types of stroking that has been going on for ages. The long process of trial and error has yielded five great strokes: the breast stroke, the side stroke, the free style or modern crawl, the trudgen-crawl, and the back-stroke or back crawl.

Now, more than at any time in the past, he has an opportunity to become a complete swimmer.

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HE SPRINGS OUT into the air head up, body straight and almost parallel with the surface. About to land with a spanking crash, he drops his head, and outstretched arms cut a hole for his body. The dive submerges him about three feet, and as momentum decreases he begins his kick—the flutter kick in this case because he intends to use the crawl stroke. The kick is strong—he can feel his legs catching the water, driving it away and thrusting him ahead. The bottom slips quickly beneath.

Leisurely he lets his kick and the buoyancy of his body drive him upward close to the surface; he draws one arm down and backward, catching an armful of water that brings him to the top. For a brief moment a change occurs somewhat akin to the shifting of the gears of an automobile. As one arm follows the other, the speed of the kick changes and in a second a rhythm is established between revolving arms and thrashing legs. His body lifts ahead, he sets his breathing to the tempo of the stroke, and his free style is hitting on all cylinders.

There is a sense of speed in the noisy wash playing about his face, obscuring his vision. Movement is easy, for muscles are fresh. As he continues, muscles become heavier,

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and breathing harder. He is really beginning to get a workout. He strives to maintain the same evenly paced stroke. Progress is steady, and he finally finishes the distance set for himself. He clambers out, muscles swelling firmly, flesh warm, lungs strong, feeling in grand condition.

There is the thrill of swimming. It combines the enjoyment of an all-around exercise and of the refreshing and relaxing effect of the water with a feeling of self-confidence—the result of ability to cruise through the water smoothly and effortlessly.

How good does your complete swimmer have to be to enjoy himself this way? Surely, he does not have to be a great competitor, nor extremely fast in the water. The swimmer described may swim fifty yards in twenty-five seconds, which is fast, or in forty seconds, which is fairly slow. Regularly he swims a distance of two hundred yards, or more—about an eighth of a mile—and he travels at a medium speed. If necessary, he could probably swim comfortably anywhere between a quarter of a mile and a mile, now and then resting by floating or treading water. He doubtless knows something of the other strokes, such as the breast stroke and backstroke, although unable to swim them as well as he does his favorite. He can also dive, although he may or may not be interested in fancy diving. He can tread water, swim under water, and in general do the little tricks that show he is at home in this landless environment. If he fell off of a boat or a dock, he would not become confused.

True, he may not be a fast swimmer, but his form will be good. In other words, he will have the fundamen-

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tal coordination, the relaxation and control that make for easy, efficient progress.

Swimming to him is an art, and each swim is an opportunity for perfecting his stroke, just as each game played by a golfer is a chance to cut down his score. If he is interested in the sport only as an amateur, dabbling at a relaxing, healthy hobby, then his workouts will not be too strenuous although they will be thorough. If he has hopes of being a champion, his principal objective will still be the development of form; but he will also work for speed, and his training will be correspondingly harder.

What physical and mental benefits does the complete swimmer get from the sport?

Assume that he has just finished a workout, as mentioned above, and is now standing on the shore, momentarily tired, muscles aching, chest heaving. At the same time he probably has never felt better in his life. The truth of the matter is that that swim has acted like an invigorating tonic. It has sent the blood circulating into little used muscles, exercised his lungs, and stimulated the important organs of the body developing stamina. Because the muscular action was steady rather than jerky, there was little strain on the heart.

Perhaps, however, his need was for an exercise that would put on muscle in the right places. Observe, then, the tendency of the pectoral, shoulder, and upper back muscles to swell after each swim. Are not these muscles located in the part of the body he wishes to strengthen? If you had just taken that swim, you would notice how strong and deep your lungs feel, sure indications that swimming is doing its good work for you. With regular

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swimming, everyone gradually develops broader shoulders, a fuller chest, and stronger thigh and hip muscles.

Growing boys and girls will find that swimming tends to keep their bodies evenly developed, equipping them with long, full muscles. Furthermore, it will not load them with heavy, useless masses of sinew that may eventually lead to a muscle-bound condition. Elderly persons, on the other hand, will find that swimming can impart suppleness and flexibility to muscles stiff with disuse.

Swimming is really a great normalizer—building up the too lean body, hardening and trimming down the overweight. Its general effect upon the body is one of bilateral-symmetry. The new strokes use the muscles on both sides of the body equally, whereas the older strokes, such as the side stroke and the trudgen, tend to overdevelop one side. Swimming brings into play the extensor muscles of the legs, arms, and back, muscles which are often not exercised by everyday activities. The build of swimmers like Weismuller is impressive because of the evenness of their development and the fact that their muscles, although large, do not bulge but taper and curve in long, easy lines. Just as this sort of build is streamlined for most effective work in the water, so it is admirably suited for the other physical actions of daily life.

Women with their relatively heavy hips, long trunks and somewhat narrow shoulders have much to gain from swimming. Indeed, the assurance that this sport will not develop a knobby, unsightly body such as often comes from certain other kinds of exercise should be encouraging to them. Swimming will strengthen their arm, shoulder, pectoral, and back muscles, and in addition will help to smooth out those bulges that sometimes appear about

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the hips. Further, the relaxation and flexibility given their joints and muscles will produce increased gracefulness and more attractive posture.

The swimmer can ask little more from his sport than that it help to build a well conditioned, healthy body and the most attractive and utilitarian sort of physique; yet, in addition, swimming offers very definite psychological advantages. Everyone who would become a swimmer must delve into his character and come out with courage, perseverance, and what is sometimes called "intestinal fortitude." There is no belittling the mental discipline needed by most beginners to down those fears that grip them when they first enter the water. And during those periods when progress is slow and muscles are tired, determination means the difference between good and poor swimming.

Perhaps the best example of a person becoming a complete swimmer and of the therapeutic and psychological benefits to be found in the sport is the Cleveland man who, like many other business men at the age of forty, was exhausted from worry and overwork. This man had made a hasty attempt to rebuild his health, trying all sorts of remedies, such as gymnastics, handball, running, but with no success. Beginning to doubt the efficacy of any sport, he decided to try swimming as a last resort. He was taken in hand by a coach, more or less as a case study in what daily swimming might do for anyone who had slipped so far physically. Day by day the coach had his answer.

Here was a man who could scarcely swim fifty yards when he started, who lacked not only a knowledge of the strokes but the physical energy to propel himself more than a short distance. Gradually he perfected an easy style of crawl stroke and, increasing his distance with each visit

to the pool, soon found he was swimming from a half-mile to a mile daily with ease as well as pleasure. His growth in vitality kept pace with his improvement in skill; and at the end of three months, he was capitalizing on swimming for the health benefits he needed. Similar examples can be mentioned of boys at camp, or young men in school who have found swimming a healthy hobby that will stay with them for a lifetime.

Learning to Swim

Equipment

AFTER THE SWIMMER has become an old hand at this sport the conditions under which he swims will be of less concern than now. If the beginner, however, seeks a place where the water is warm and clear, and the bathing area attractive, his first experience is more likely to be a pleasant one.

It is even advisable that care be taken in selecting a swimming suit that is both attractive and comfortable; today's suits generally conform to these specifications. For men, trunks, where they can be worn, are handy for all-around usage. If tops are also worn, then something that will not tighten around the chest or flap loosely about the body is essential. Some women's suits are excellent; some, however, are so constructed that the shoulder straps can easily slip down over the shoulders, hampering the movement of the arms. Both men and women should try to choose suits that do not bind the shoulders too tightly, making an overarm stroke tiresome, that do not interfere with the breathing, and that are not too loose and heavy. Competitors use cotton and more often silk suits. Although these are not always practical for outdoor swim-

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ming, other form-fitting suits of light, strong material are available from which a swimmer should be able to pick something in which he will feel comfortable and look well.

The beginner will find his swimming experience more enjoyable if he does not make his first attempts alone, for swimming with a friend or "buddy" or under close supervision provides a sympathetic and friendly safeguard. Sections where the bottom and depth are unknown, where there are rocks, snags, or where a strong current flows will be both physically uninviting and dangerous.

Artificial pools are attractive enough to lure any non-swimmer. Their depths are often plainly marked; they are well supervised by lifeguards and instructors, and sometimes there is a special pool for beginners. Furthermore, modern equipment for pumping, heating, and purifying the water has made these pools clean and hygienic. The temperature of the water should be agreeable, for the beginner chills easily because of his nervousness and apprehension. In swimming in pools, the habit of taking a towel along and drying the body helps to prevent shivering.

Instructors

The easiest and quickest way of learning to swim is at the hands of an instructor. This often means joining a class, and mass instruction produces excellent results. Companionship, if not rivalry, inspires most swimmers. The presence of the instructor and of others working for the same objective increases confidence and reduces latent fears. Learning under the watchful eye of a coach provides

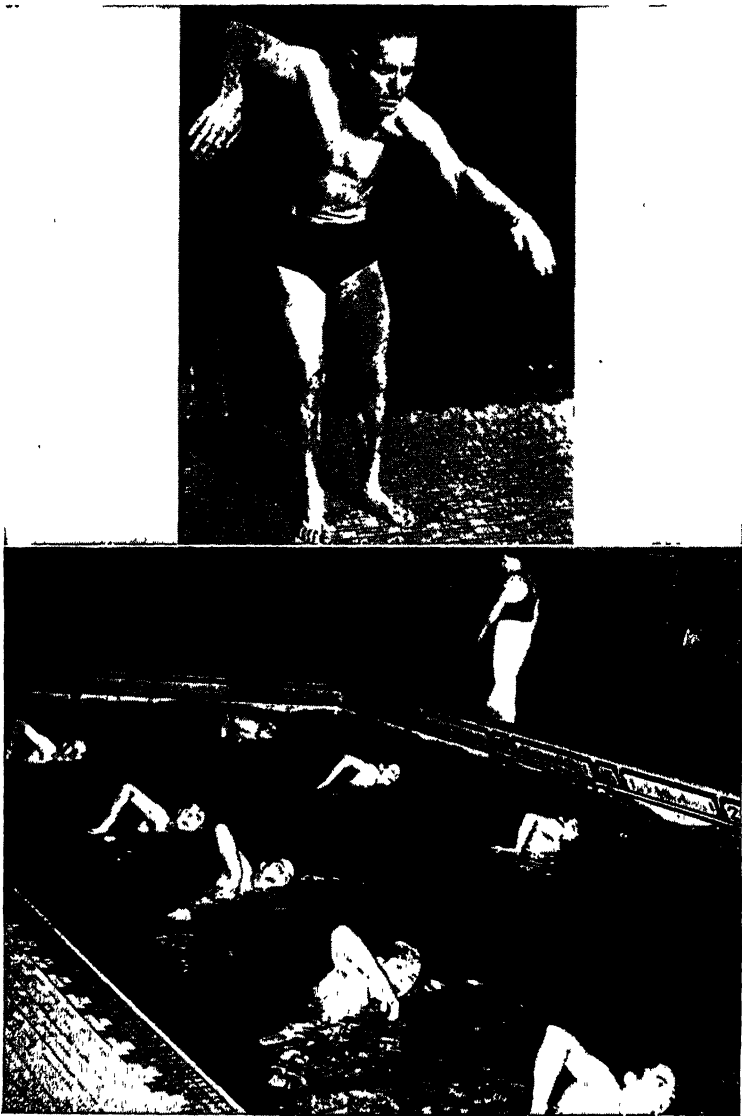


FIGURE 2. Instructor demonstrating strong pull of left arm and relaxed recovery of right arm to beginners.

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a check against the development of inefficient motions that can easily become habitual. (Figure 2)

Yet, persons can learn without expert personal assistance if they have the will and the desire to do so. Observance of experts will stimulate and guide progress. Merely by consulting any average swimmer, the beginner can get an objective appraisal of his early attempts. What we ask here is that these methods of practicing shall be tried with confidence and interest as if they came from an instructor personally.

The beginner is asked to forget for the moment that he is "learning to swim." The phrase too often connotes a depressing struggle with an unfriendly element. Rather should this be looked upon as a simple matter of learning a skill or sport just as one learns to skate or ride a bicycle. The muscles are to be taught to function properly in the water just as in skating they must be adapted to usage on ice. Considered this way, swimming can be undertaken confidently and cheerfully and with the expectation of immediate results.

The Arm Stroke—Land Drill

Anxious as the beginner is for his first dip, it may well be postponed until after a drill on shore. This will be his first acquaintance with the movements of a swimming stroke, and awkwardness is to be expected. Yet, careful analysis and practice of the arm action on land will make it far easier to perform it correctly in the water.

This is to be the alternate overarm stroke of the crawl, the best yet discovered for all-around use in the water and the one that has been used by most of the world's great

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swimmers in the last quarter of a century. It has two parts: the pull, in which the arm is driving against the water beneath the body; and the recovery, in which the arm has ceased its work and is carried to the forward position. The objective is to make the pull strong, the recovery effortless, and to time the movements so that one arm is always pulling.

Imagining he is stretched out flat on the surface of the water, the swimmer can bend his trunk at right angles, extend both arms in front of his head and slowly pull one backward beneath the body until it reaches the hip. At this point the elbow is raised and the arm is swung forward while the other arm simultaneously begins its pull. From that point on the two arms can continue their alternate movements, one arm always finishing at the hips as the other begins to pull, just as if a hinge extending through the shoulders joined them.

With the arm almost straight, the pull is downward and backward and not outside the shoulder. At the end of the pull, the arm bends sharply, the elbow is lifted high and recovery is made in front of the head. Pretending he is gripping the water, the swimmer can pull strongly although not rapidly, letting the shoulder muscles do most of the work. Inasmuch as the recovery is a purely negative action—in other words, does not contribute to forward progress—it should be a quick, easy flip that will not hinder the stroke.

The fundamental positions of the stroke in the land drill are illustrated in Figure 3, A-D, and can be practiced in front of a mirror. The drill need not be long or tedious. It is a means not only of learning graceful control of the arms but of limbering and exercising the muscles.

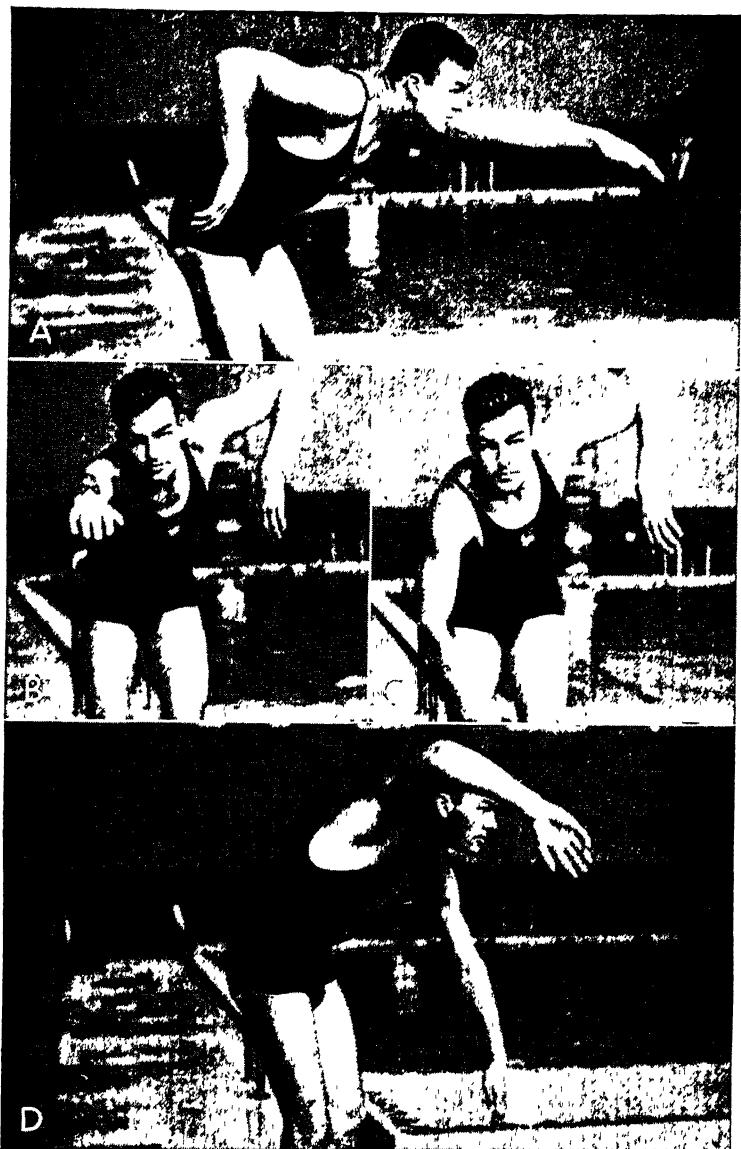


FIGURE 3. Correct movements in the land drill.

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First Entry into the Water

The beginner drops into the shallow end of a pool or walks down a gradually sloping beach into water a few feet deep and immediately experiences an exciting series of sensations. The coolness of the water sends a faint chill curling up the body. Once the water is around the chest it exerts a surprising pressure which seems to hamper breathing until a few deep breaths convince the beginner otherwise. Meanwhile the pulse quickens and the muscles become tense, partly because of the faint chill and partly because of the newness of the experience. Now is the time for the swimmer to move about a bit to learn just what is what in these new surroundings. He might as well let himself go, and if he feels like it, splash, rub water on his arms, chest, and face, puff, blow, even jump up and down and yell. This is the first step in becoming acquainted with this new element, and all these little movements help to put the beginner at ease.

He can continue to make this first meeting as much fun as possible by learning all he can about his new friend. Feeling the lifting effect of the water, he can take advantage of it by squatting, then jumping high in the air. Feeling the pressure, he may want to walk about rapidly as the beginner in Figure 4A is doing. This will suggest how solid the water really is. By pulling his arms as he walks, the swimmer can discover what kind of leverage is needed for swimming. Leaning forward a bit, he can dip both hands and endeavor to pull himself forward. This will show the strength of the pull that can be exerted in stroking.



FIGURE 4. *A*, Getting acquainted with the water. *B*, Ducking. *C*, Opening the eyes under water. *D*, Blowing bubbles. *E*, Exhaling as head breaks water.

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The Arm Stroke—Water Drill (Figure 5)

Now is the time to experiment further with the arm stroke. Leaning forward until the water is about up to the chin, and stretching both arms ahead about eight inches below the surface, the same alternate stroking can be executed here as on land. One arm is pulled back to the hips and as it begins to recover the other begins its pull beneath the body. This is a new element, and the arms will not at first respond to directions very well. If the stroke feels too unwieldy, the movements of each arm can be practiced separately.

Instead of trying to make every detail of the stroke correct at once, the beginner can center his attention on four fundamentals: first, the beginning of the pull with the arm extended directly in front of the head and about eight to twelve inches under water; second, the middle point of the pull with the arm passing underneath rather than outside the body; third, the height of the elbow and the relaxation of the forearm in the recovery; fourth, the timing in which one arm is always in the water pulling while the other is in the air.

These are the basic essentials of the stroke that has made distance and speed records, but that at the same time has proved to be the easiest for a beginner to learn. Let the swimmer try to pull strong enough to make himself walk through the water if he is interested in knowing how effective it is.



FIGURE 5. Arm stroke and breathing from standing position.

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The Kick

Now, while experimenting with the propulsive worth of the overarm stroke, is a good time for the beginner to test the kick that will eventually be combined with it to give him an elementary crawl stroke. This will be the flutter kick famed as the primary reason for the speed of modern swimmers. It is a continuous up-and-down thrash which, although it corresponds to no movement made on land, is not too difficult to learn.

It can be practiced from a prone position in shallow water, with both hands on bottom supporting the body. It can be practiced in a pool by grasping the edge with one hand and by bracing the other against the side, a foot or more under water. (Figure 6)

At the outset it is almost impossible to feel the propulsive possibilities of this kick as in the arm stroke. Yet, the objective is so to work the legs that from hip to feet they are continuously squeezing, pushing or flipping the water away.

By beating them alternately up and down in an area slightly larger than a square foot, the swimmer can obtain a thrust similiar to that imparted by a ship's propeller. Power comes from the trunk, the hips, and the upper part of the thighs. The beginner should imagine he is lifting the legs from the body as if they had no strength of their own. The knees should be permitted to bend but slightly at this point. The legs can be moved slowly up and down while the beginner tries to feel them pressing against the water. The ankles can be turned inward if the position is easier. Instead of trying for a kick that splashes water high,

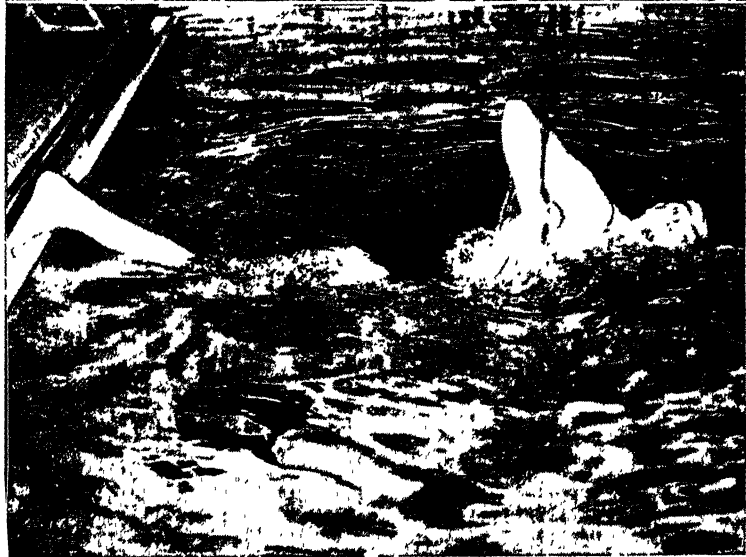


FIGURE 6. *Top*, Kicking drill combined with breathing.

FIGURE 7. *Bottom*, Stroking drill with breathing.

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the beginner will try to make a small boiling wash, with the heels barely breaking the surface.

The flutter kick is timed in terms of "beats," each beat comprising the movement of one leg to maximum upward extension and the other to maximum downward extension. Each time the legs pass marks a beat, and as he practices the beginner can count, "One, two, three, four, five, six—one, two, three, four, five, six," for experience has shown that a six-beat kick is best with the overarm crawl stroke. This means that six kicks are executed to one revolution of the arms. Counting will facilitate mastery of the timing of this kick.

So far the beginner's short experience in the water has consisted mainly of experimental drills to teach him an effective pull and kick. He may be wondering at this point how he is to breathe once he attempts to stretch out in the water and use his arms and legs as instructed.

Breathing

To breathe properly while swimming is an art demanding as much attention from the beginner as does practice of the pull and kick. Breathing would be less of a problem if man had more buoyancy. As the beginner will discover later, however, his body floats too low in the water to permit breathing without lifting the head or rolling it sideways. His task then is to learn a stroke which will enable him to get enough air to avoid tiring quickly.

Before this is attempted, however, the beginner will have to learn to control his breathing so that, whenever water covers his nose or mouth, he will stop inhaling and thus avoid the strangling effect of a "mouthful." It is not as dif-

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ficult as it may sound, however, for man is an adaptable creature and instinctively shifts his breathing to make it conform to the limitations of this new element.

The first experiment is to prove that the water will not run up the nostrils and, incidentally, that it will not hurt the eyes or ears, when the head is submerged. In water about up to his waist, the beginner can duck quickly (Figure 4B), then rise and with both hands push back his dripping hair, wipe the water from his eyes and blow out a few drops which may be in his nasal passages. Having convinced himself that he has suffered no ill effects, he can repeat the experiment a number of times.

The next step is to draw a deep breath, submerge, and stay there. No water will enter the nose or mouth, and the breath can be held quite easily. He can now hold one hand out in front of the face and open his eyes to look at it (Figure 4C). He can move the fingers, study them at various distances, then return to the surface and recite his observations. How well could he see? What was the color of the water? Did it bother his eyes? His ears? Was there any difficulty in holding his breath?

He can also exhale under water. "Blowing bubbles," it is called, and the swimmer instead of watching his hand can now watch the bubbles drift up in front of his face (Figure 4D). The air can be expelled through the mouth and nose, although inhaling is completely through the mouth. In this exercise all the air in the lungs should not be blown out, nor, after a time, need the lungs be filled before immersion.

A close approach to the rhythmic breathing required in swimming may be attained by exhaling as the head breaks water (Figure 4E) and then by immediately inhaling

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and dropping under water again. To clear the nasal passages for the next breath, the swimmer may blow out slowly and then, just before breaking water, give a short puff. The process is something like this: inhale, duck, pause, exhale slowly, puff breaking water, and immediately inhale again. This may be done regularly ten or more times.

This is a rough approximation to breathing while stroking, because the nose and mouth are alternately under water and above the surface. The beginner is now ready to adjust his breathing to his arm motion, and this may first be tried in a land drill. The natural method, he will notice, is to exhale with the pull of one arm and to inhale with the pull of the other. A breath should be taken just after the pull begins, and released during the corresponding pull of the other arm.

This drill may be continued in the water, first with the face above the surface and then with the nose and mouth alternately submerged and raised for a breath. With the arm stroke the head is turned to the side, the chest and shoulders remaining on the same plane. There is no need to twist the body; a slight easy swing of the head to the side is all that is necessary (Figures 5 and 7). If he wishes, the beginner may try breathing on either side. In practicing the flutter kick, he may also experiment with breathing, inhaling on every alternate three beats (Figure 6). The non-swimmer has now tested the harmlessness of the water, has studied the actions necessary to move in it and has become somewhat accustomed to breathing in it. He could now combine these movements and begin swimming, were it not that there are some questions in his mind about buoyancy.

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Buoyancy

Because it weighs slightly less than an equivalent amount of water, the human body floats. Therefore, beginners need not handicap themselves with the notion that learning to swim is the process of learning buoyancy. Almost everyone can float motionless in the position indicated in Figure 8. Some are so buoyant that they can lie on their backs in an extended position, feet, arms and hips on the surface. Others may find that their legs sink a little while still another group will discover that their legs drop into a perpendicular position and that only with great difficulty can the nose and mouth be held above water. Last, there are the "sinkers" who lack sufficient buoyancy to stay up without moving their arms or legs.

Man's buoyancy is actually such as to make him a most versatile performer in the water. He can dive into it from great heights, swim on the surface or, without any difficulty, swim under water. He can do innumerable tricks—somersaulting, emulating the porpoise, plunging for considerable distances, and the like—that might be impossible if his buoyancy were greater or less. One of the pleasures of the beginner is experimentation with his buoyancy to observe how many fascinating maneuvers he can put himself through.

Lying in extremely shallow water on his back, he can draw a deep breath, feeling the lifting effect of the water; exhaling quickly, he will notice his body sinks a bit. Sitting down in slightly deeper water with hands on the bottom at his sides, he can easily raise the legs and hips to the surface so that only the hands still touch. Lying easily on



FIGURE 8. *Top*, Floating motionless.

FIGURE 9. *Center*, The jellyfish.

FIGURE 10. *Bottom*, The glide position.

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his arms, he will find the lifting effect still more noticeable. He can experiment a bit by bending his elbows so that the water is almost completely supporting him. He may observe that the feet and hips seem to be the heaviest parts of the body. The flutter kick has a secondary value of lifting the legs and hips, as the beginner may notice in practicing it.

Floating

Moving to where the water is up to his chest, the beginner can put his buoyancy to a real test by sliding his hands down his legs, grasping his ankles and pulling his knees to his chest. Even before his knees are fully raised, his body will have rolled forward slightly; and to his surprise, instead of his feet remaining on the bottom, he will notice that the bottom is a foot or so below them—that he is floating (Figure 9). To resume a standing position, the body need only be straightened.

Again let him emulate the “jellyfish,” but this time, as the legs float clear, slowly slide them backward out of his hands toward the surface. For a moment the body will be floating in the prone, or swimming, position. The head and shoulders will remain in approximately the same position, but the legs will almost immediately begin to sink; and as soon as the feet touch bottom the beginner can stand again. After a few trials, the beginner will be convinced of his ability to float.

Just as momentum makes balancing a bicycle easier, so it assists a body in remaining in the horizontal or swimming position; therefore the beginner may now want to learn to coast or glide along the surface. Facing the shore

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in water chest-deep or facing the side of a pool from about two yards away, the beginner, by extending the arms with the head sandwiched in between, can slowly bend forward and, about to lose his balance, give a vigorous push ahead. Lying flat on the surface, he should glide for several feet (Figure 10). To stand erect the head should be lifted, the arms pulled downward, and the legs drawn toward the chest.

After a time, the head can be tilted slightly upward so that the foam piles up at about the level of the eyes. This is the position eventually to be assumed in swimming.

Swimming

The beginner has now practiced four separate swimming motions: the arm stroke, the kick, breathing, and gliding prone on the surface. Let him assimilate them all into series of connected movements, and he will be swimming.

The first step is to try the glide as before and immediately begin to kick, still maintaining the same position. After a few kicks, he can stand erect.

The second step again begins with the glide, followed by the kick; but this time, before stopping, a few overarm strokes of the sort he has been practicing are tried. The process will be this: push off in coasting position; kick several beats; pull one arm backward and when it reaches the hip, begin to pull the other. The breath is held throughout the series of movements.

The third step is to try to introduce breathing into the stroking as previously practiced.

As a result, a swimmer is born, although he is by no

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means the complete swimmer mentioned in the preceding chapter. Yet, if he can move a few strokes along the surface, he may expect rapid improvement. Some from the first will grasp the fundamentals of the crawl and will daily progress rapidly in ability and endurance. Most beginners, however, will have to repeat the series of exercises previously described, winding up each time with several attempts at swimming. A yard or so more each day, and sooner or later coordination will come in a rush.

Although some may acquire an overarm stroke at the outset, others will slip more easily into the so-called dog-paddle or human stroke, which is really an elementary crawl. For new swimmers who tend to strain for too high a position in the water and thus have trouble with the long pull and the overarm recovery of the crawl stroke, the more elementary stroke is easier. Less balance is required, and breathing is a relatively simple matter.

Because the arms execute a short reaching or pawing motion in front of and below the shoulders, the head can be held high, and there is no splashing to interfere with the beginner's concentration. The kick is sometimes easier to learn than the up-and-down thrash because it is roughly similar to walking upstairs. It consists of alternate thrusts backward with the flat of the foot, the knees bending and straightening. Each leg kicks the opposite arm forward, which is probably a more natural coordination than that of the crawl.

No matter how well they swim this stroke, beginners should realize that their learning process is far from complete. They have yet to master the full arm pull and the over-water recovery of the crawl. Although adequate for their present purposes, this elementary stroke is too ineffi-

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cient for speed, distance swimming or for regular all-around use.

There are three ways in which the beginner can speed the change to the crawl. First, the drill in the orthodox crawl arm stroke and kick can be continued. Second, the elementary arm movement can be lengthened, and now and then an overarm recovery essayed. Third, the kick can gradually be altered so that the shin and ankle and later the whole leg beat against the water.

Development will be easy and constant if pains are taken to master the correct fundamental motions. It will be uncertain and difficult if the beginner is more interested in learning to swim by hook or by crook than in learning to swim well. Let the beginner bear in mind that he is building a foundation for his future strokes—that he does not want to learn what will have to be unlearned later.

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Strokes

In the past, the breast stroke and the side stroke were considered the easiest strokes for beginners and self-taught swimmers, for to a certain extent the kick in which the legs are pushed or squeezed seems to be a more natural one. Yet, the experience of recent years has shown that the crawl stroke movements are generally learned more readily than these two.

Eventually almost everyone wants to learn the crawl, and those who start with the breast stroke, side stroke, or any stroke with a scissor kick find the transition extremely difficult.

The crawl stroke has the advantage of enabling man to breathe without lifting his head clear off the water. In

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some strokes, such as the breast or the side stroke, the leverage of the arms causes a slight rise and fall of the body and thus makes rhythmic breathing possible. Most beginners make the mistake, at first, of using the power of their arm stroke to keep the body in a high abnormal position in the water. The effect is to throw the hips and legs too deep and to cut the efficiency of the stroke in half. Those who have this tendency should review for a moment their buoyancy tests, recollecting that the feet have less buoyancy than the head and shoulders, and that the body in the glide position floats well enough without any need to support it by use of the arms. The attempt to hold the head too high also indicates a reluctance to get too close to the water, which can be overcome by further resort to breathing and ducking exercises.

When breathing in the crawl is performed correctly, however, the head need only be swung a few inches sideways. This will clear the mouth for a quick breath. When in this sideways position, the head creates a small pocket in which it is possible to get a breath. Although the beginner may have no difficulty in breathing on every alternate stroke, as is preferable, the ability to get a quick breath does not come without a certain amount of spluttering endeavor. It should be accomplished with as little rolling of the body as is possible.

As a matter of fact, the beginner's most difficult problem is not to keep the head in a position where he can breathe easily but to keep the other parts of the body high enough not to be a drag on the stroke. This faulty position may be due as was suggested to a desire to keep the head too high out of water or to a weak kick. If the swimmer imagines himself to be swimming downhill, he is more likely

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to achieve a comfortable position that will make his swimming easier and stronger.

Artificial Aids (Figure 11)

Once it is possible to swim a few yards, there are a number of special gadgets that can be used to speed progress. The waterwings are most popular and should be slipped not under the chest but under the hips where buoyancy is most needed. Staying in shallow water, the swimmer can try to coordinate stroke, kick, and breathing. By permitting him to forget about body position and buoyancy, aids such as waterwings enable him to concentrate on the stroke.

Kicking boards, which are buoyant pieces of wood roughly two and a half feet long and eighteen inches wide, are also available. The beginner by stretching his body part way on top of these boards and holding to the top can practice his kick in shallow water.

Floating on the Back

If the stroke develops slowly, the swimmer can avoid discouragement by trying any number of interesting skills which increase his general ability as a waterman. In shallow water, lying on his back, he can learn to buoy his hips up by a slight sculling motion of the hands, the palms parallel to the bottom. Many swimmers cannot keep their legs on the surface without additional support of this sort, and it represents an easy and relaxed way of resting on the water with only a minimum of effort. The palms are simply pressed lightly downward and moved back and forth

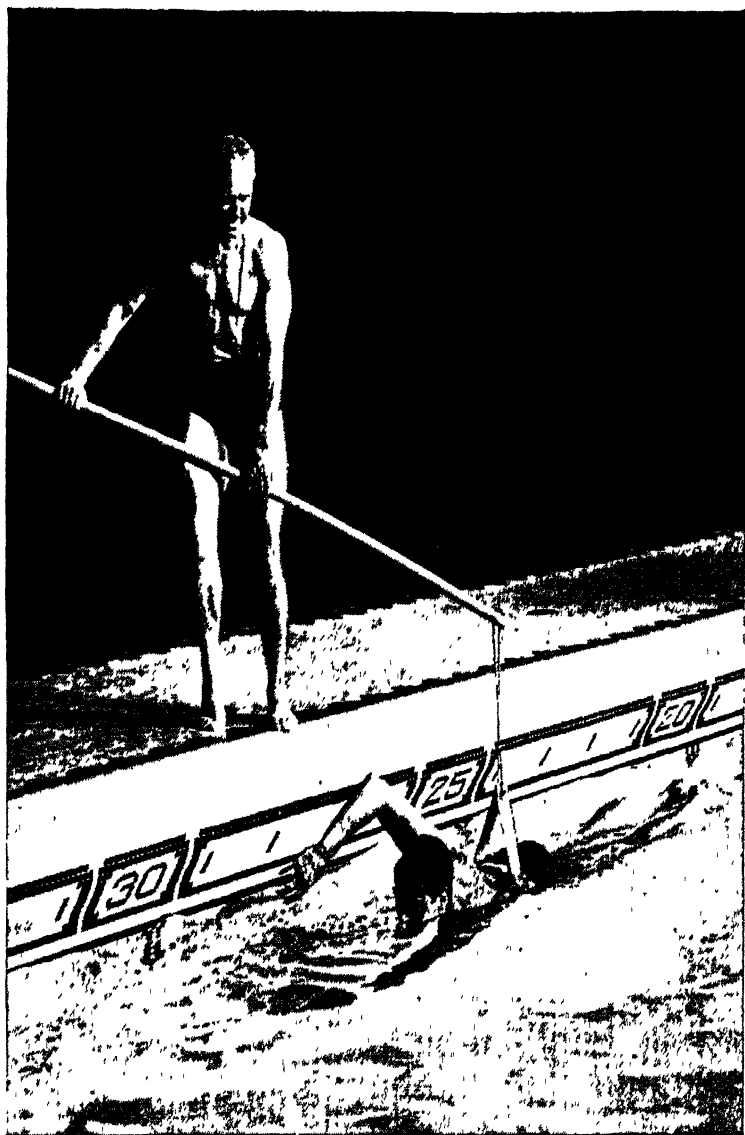


FIGURE 11. One means of assisting beginners.

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in a twelve-inch area. Still lying on his back, the beginner can gradually edge himself outward until clear of the bottom. It is possible to slip into this same position on the back from the "jellyfish" float by sliding the legs forward to the surface and lying backwards. The hands can again be used for sculling.

To progress while resting on the back, the hands can be swept in small circles at the side, with most of the action in the wrist, the elbows bending slightly, then straightening with each backward flip. The hand recovers parallel with the bottom, straightens so that the palm is at right angles with the surface, then scoops backward to the side. This sculling motion can also be accompanied by a flutter kick. This kick is essentially like that in the crawl with the power furnished by the hips and the knees bending slightly, if at all.

The beginner is really learning the fundamentals of the back crawl, and eventually will extend the arm pull until it is a long sweep from a point behind the head to the side with an above-water recovery. Most swimmers prefer not to turn to this stroke, however, until they have learned to swim smoothly and easily in the crawl.

Ability to swim under water is a valuable part of any beginner's equipment. It is a continuation of his under-water experience and demonstrates to him that this under-water world is not as fearsome as might be imagined. First attempts at it should be made in clear, shallow water. The beginner may, after submerging, push from a bent-knee position to a point on the surface a few yards away, floating to the top. From a standing position, he may select a point on the bottom three or four yards away and thrust his body forward as if attempting the glide, except that

Learning to Swim

this time his arms aim obliquely downward. No stroke need be taken at first. It is far more fun to be able to descend to the bottom as a submarine does in a "crash dive," that is by tilting the hands downward so that the pressure of the water against the inclined surface makes the body descend. This "crash dive" should be performed with the eyes open, and the head raised slightly so that the beginner can look ahead to the point at which he is aiming. Later, as he learns the breast stroke, the swimmer can begin to practice under water with this stroke.

If the beginner has followed these various exercises faithfully, he will by now have acquired not only a certain amount of skill in the water but greater ease, both physical and mental, in this element. He has learned an overarm stroke, a leg drive, and the proper way to breathe. His movements may still be ineffective and faulty, yet he has a good idea of what is required to move his body through the water.

The beginner's advance may have been rapid or slow, according to the time he had to devote to these exercises and his ability to adapt himself to this new element. After a time, however, each day will bring improved form and an ability to swim farther, until suddenly he will find himself thinking of his swimming no longer in terms of the distance he can cover. He will now feel confident enough to swim in water over his head.

Deep Water

Before venturing into deep water, the beginner, like a ship undertaking its first voyage, will want to make certain preparations. Several attempts at lifting his body to the

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swimming position should be made in water about up to his neck. Inasmuch as he may be learning the elementary dive at this time, he can practice under supervision, jumping into deep water and leveling off to swim a few yards to shore. This is a safeguard in case he has to start swimming from a perpendicular position in water over his head.

A trial voyage in the familiar shallow waters can be first attempted, by swimming twenty-five yards, turning and swimming back to the starting point. The turn is executed not by coming to a stop and twisting about, but instead by swimming in a wide circle, pulling more strongly on one arm.

Finally, under the supervision of the instructor or another good swimmer, the maiden voyage is undertaken. A leap into the water and a few pulls and kicks to get to the surface, and he is under way. Pulling slowly to conserve fuel the newly launched ship moves into new territory—deep water—continues sturdily onward, turns carefully so that the legs will not sink, then heads back to home port, this first voyage a success.

Having become a full-fledged swimmer, he can now work to make the stroke perfect and to practice other strokes. Also, it is time to learn how to enter the water from an elevation—in other words, how to dive.

Learning to Dive

ALTHOUGH THE WATER can present a hard surface to a falling body, mastery of a few simple fundamentals enables man to enter from varying heights with no difficulty whatsoever. As long as the arms or the feet cut a hole through which the rest of the body can follow, there is no reason to fear injury.

Certain precautions should always be taken. Diving from heights of above one or two feet should not be undertaken until the beginner is confident of his body control. The surface from which he dives should not be slippery; the depth of the water should be carefully ascertained, and the bottom should be free of obstructions. Snags, rocks, and shallow water can make diving an unpleasant experience.

Diving will at first be from the edge of a pool, float, or dock. For the first few times entry can be feet foremost, the body stiffly erect, the head bent slightly forward, the arms extended over the head, thumbs locked. If they are held at the sides, care should be taken to prevent their being wrenched by the downward thrust. To prevent the water from rushing up the nostrils and into the sinuses, the beginner should learn to exhale through nose and mouth after entry, or he can, if he wishes, hold his nose.

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The head is the controlling factor in all dives, because it is heavy and can be easily moved in any direction. Once the body is in the air the head is the rudder that steers it. If it is dropped, the shoulders drop with it, and the body invariably follows. If it is raised, the shoulders and trunk arch upward. If it is twisted, the body does likewise. To make certain that his entry is correct, the beginner can wedge the head tightly between the biceps of each arm, then bend forward so that the arms and head point downward. If the eyes are then fixed on a point a few feet from the diving edge, and the body is allowed to fall forward, there will be no feeling of impact at all.

Thus the first rule of diving: Keep the head down. Most beginners in an effort to avoid getting their heads wet, break this rule with disastrous results.

Although the upper part of the body can be guided successfully in this fashion, the legs present another problem, for with nothing to lift them, they tend to slap the water. For this reason, a good dive must be executed with a spring that throws the legs upward sufficiently to permit them to enter in line with the trunk. The higher the legs are thrown, the nearer to perpendicular is the body's position on entry.

Most beginners find diving from one leg the easiest way of achieving a neat entry (Figure 12, A-C). The arms are stretched overhead, thumbs locked and one leg is lifted backward a few inches. The dive then becomes a combination of the two movements of bending the trunk forward and simultaneously raising the leg until the swimmer topples forward as the hands touch the water.

There are variations of this method which some beginners may prefer. It is possible, for example, to start from



FIGURE 12. An easy way of beginning to dive.

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a bent-knee position which brings one even closer to the water (Figure 13, A-C). The beginner may even kneel on the edge and by bending the body forward, arms extended, drop in (Figure 14). Both of these positions cause the hips and legs to drag on entry, a fault which is avoided by diving from one leg. To get an idea of the spring that is necessary the beginner can have someone lift one of his legs as he dives (Figure 15). To execute this spring himself, he will first learn to coordinate the arms which have hitherto been held over the head, so that they add to the momentum and lead the way into the water. They are swung in a circular movement backward with the bend of the knees, then outward with the thrust. As he gains confidence, the swimmer will gradually strive for increased height and for entry closer to the diving edge.

After entry the swimmer can drop directly to the bottom, if the water is not too deep, landing on his hands, and bending the elbows slightly to cushion the shock. The legs then drop to the bottom, the trunk is raised and another spring will send him to the surface. Those who do not want to dive so deeply can come immediately to the surface by lifting the head, turning the palms upward and arching the body. This leveling off should not occur, however, until the body is completely submerged.

By this time the beginner is enjoying his diving and may want to shift to a springboard to try the fancy dives. He may furthermore want to learn the fast racing start.

He now has at least a rudimentary knowledge of diving. He knows how to enter the water cleanly and how to come to the surface. He has some sense of the control needed in a good dive. He probably has begun to realize that a dive should be a graceful thing and can be if the

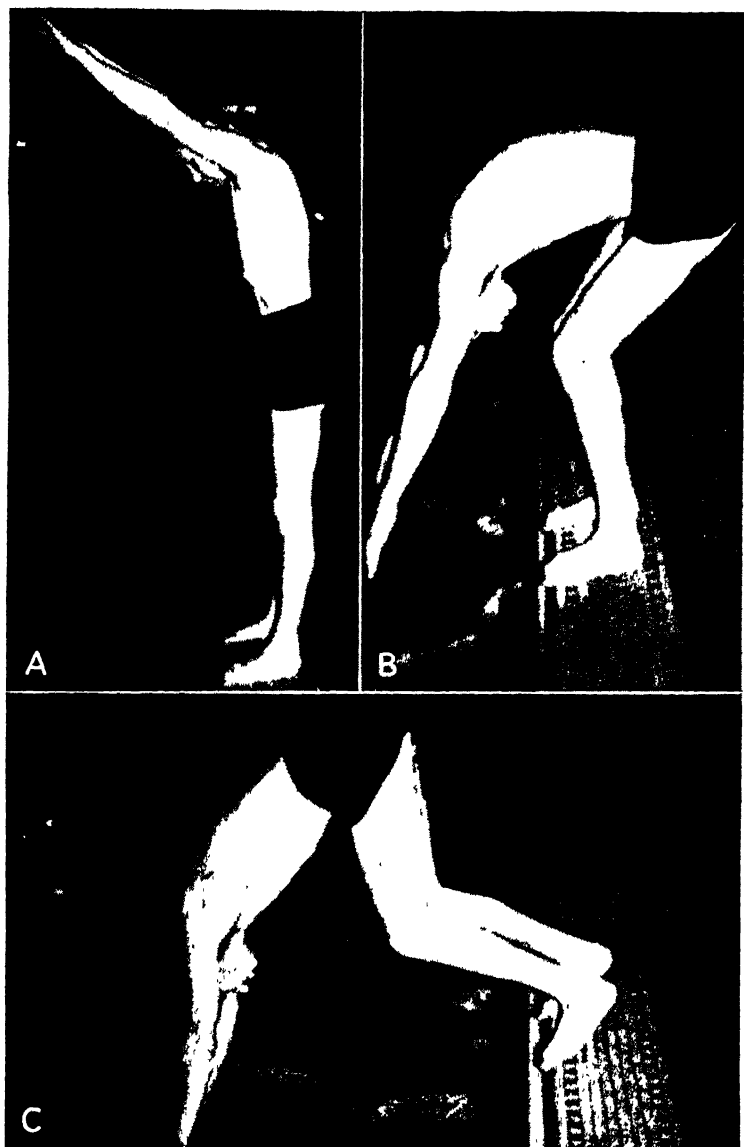


FIGURE 13. Diving from bent-knee position.

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legs are held together, and if the body is straight at entry. From now on he can strive for increased grace and height.

The Shallow or Racing Dive (Frontispiece)

This is more difficult than the ordinary plain front dive and generally is not attempted until the swimmer has mastered the fundamentals of diving. It requires considerable skill, muscular control, and split-second timing, and so closely approximates the "belly-whopper" that many run the risk of a pounding when they learn it. Nevertheless, it is thoroughly essential, and has a number of uses aside from that of furnishing a quick means of starting in races.

It simplifies the process of getting the stroke under way after entry because its momentum is outward rather than downward, and keeps the body from sinking more than a few feet below the surface. It is of special benefit to the crawl stroker who with an ordinary dive might have to breast-stroke his way to the surface. It is a speedy means of entering the water in an emergency and in lifesaving enables the rescuer the more readily to keep his eye on his victim. Finally, when diving into shallow water is necessary—it should be avoided—this is the dive to use.

In it the swimmer seeks an entry in as close an approximation to a horizontal position as is possible without actually landing flat. No longer interested in height, the swimmer now leaps outward (see frontispiece) and is careful to submerge no more than three or four feet. The dive is roughly the same for use with any of the strokes.

Because proper execution depends primarily on an outward rather than an upward spring, a crouching position

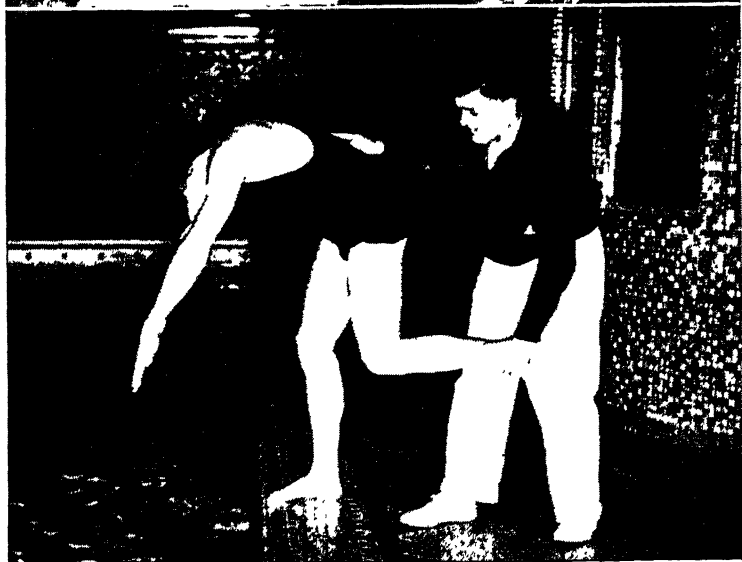


FIGURE 14. *Top*, A third way of learning to dive.
FIGURE 15. *Bottom*, Assisting the legs into position.

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is generally convenient. The swimmer stands easily on the extreme edge of a pool or float, back bent parallel to the water, head and chin up, arms hanging loosely in front of the body. The knees are bent, and the toes lap over and grip the edge to furnish the necessary leverage. From this poised position the swimmer can hurl himself forward in a long spring. The arms circle backward as the body tenses so that when the actual leap takes place they swing to the front, extending on both sides of the head, thumbs touching. The drive of the legs resembles that of a line-man charging in football. The straightening of the legs should yield enough power to throw the swimmer into a flat position over the water, his body a straight line from fingers to toes. The position of the head is again important. It is held up at the outset, causing the body to straighten into the horizontal position. To prevent too flat a landing, it is dropped just before entry. This tilts the shoulders and trunk downward so that the finger tips and arms make the hole through which the rest of the body follows. Enough depth should be sought to allow a clean entry and to take advantage of any natural buoyancy which tends to carry the swimmer forward and to the surface again.

After the dive, the swimmer can coast for several feet under water in the extended position that causes the least resistance. If he intends to use the crawl stroke, he will begin with his kick and use the first arm pull to bring him to the surface. With the breast stroke, the arm stroke comes first and the kick is then used to drive the body forward and upward. To take a flying start in the back stroke, the swimmer will use the same method of entry but upon submerging will roll onto his back by scooping

Learning to Dive

one arm from the extended position backward and sideways, and by rolling the shoulder with it. The back stroker then can use his kick and one arm pull to bring him to the surface.

Special Skills in the Water

THE ACTUAL PROCESS of stroking through the water by no means completes the swimmer's experience. There are other skills to be learned, some as simple as swimming under water, and there are games to be played, most of them far less strenuous than water polo, famous as the most gruelling of sports. All contests using a ball of some sort or other seem to appeal, although often the larger the ball (Figure 16) the greater the fun. Throw a ball into a pool, which may be shallow or deep, divide into teams whose objective is to get the ball to the opponent's goal, and notice the great sport that everyone has. Water polo can be modified into all kinds of interesting games, such as water basketball, with ducking and holding eliminated. In a bright, clean swimming area where the bottom can be easily seen and where supervision is good, "watermelon water polo"—it may have other names—is great sport. The watermelon does not float well and is under water half the time, which only adds to the confusion and fun. The objective of the game is for the teams to push the watermelon to the opponent's goal.

Treading Water

To frolic in the water, the average swimmer needs to know a number of the more rudimentary skills such as

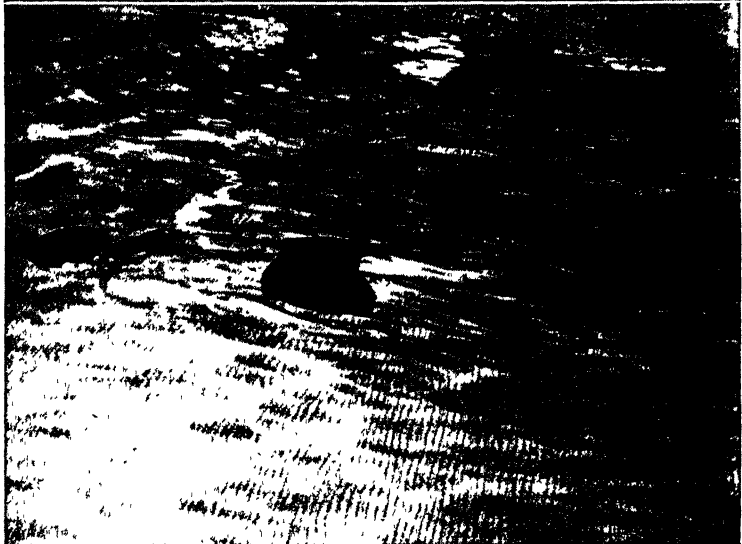
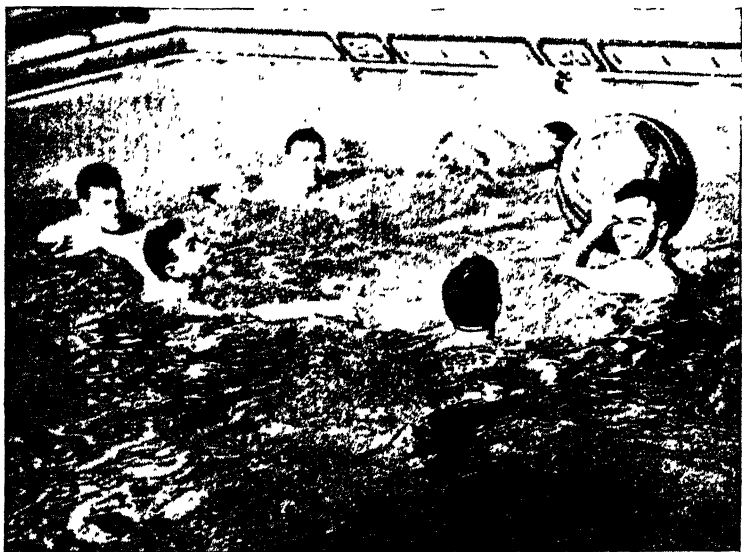


FIGURE 16. *Top*, A big ball, two teams—and fun.

FIGURE 17. *Bottom*, The torpedo glide in the underwater breast stroke.

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treading water. Those who have taken their first swimming test, and who are now engaged in improving their strokes will find it advisable to vary their routine by spending a little time on these easily mastered skills.

The swimmer who is unable to tread water, for example, must perforce always be paddling about although he may want to stay in one place. If he stops, his feet will sink, and he will not know what to do with them except to hoist them to the surface and to start swimming again. Learning to tread water, he will find that this easy way of staying afloat in a vertical position is as restful as floating on the back and, if he is short on buoyancy, a lot easier. It is helpful if he is ever in an emergency position where he cannot use his hands for swimming, where he needs to hold up some other swimmer, pinch a cramp out of his muscles or free himself from encumbering clothing.

Learning to tread water calls for the mastery of kicking movements some of which are described in later chapters, and which the beginner who has just learned to swim with the crawl stroke certainly will not know. The different methods of treading water may well be practiced, then, at the time the swimmer is learning the stroke requiring the same kick. Thus, if interested in the breast stroke, he will find it possible to hold himself afloat in the vertical position with small breast-stroke kicks. In fact, almost any kick that is worth its salt will hold a swimmer upright, without the necessity of his using his hands. Treading water may even be looked upon as a means of practicing swimming kicks.

The beginner who knows only the flutter kick may get some idea of the ease with which he can stay on the sur-

Special Skills in the Water

face by hanging onto the side of a dock or pool and allowing his body to sink a foot or so. Then, still holding on, he can set his legs to thrashing back and forth just as he would in a horizontal swimming position, and his kick will drive him to the surface. Little force is needed because the natural buoyancy of the body permits it to sink no more than a short distance under water. Submerging again, let him once more kick to the surface and this time let go of his support. Although the flutter kick is not the easiest way of treading water, it will serve the purpose temporarily until he has learned the double scissors or pedaling, which is perhaps the most natural way of staying afloat in the standing position.

It is much like walking, the knees lifting and the legs alternately pushing out, down and back. The body will probably have to be tilted slightly forward and the arms can at first be sculled or paddled at the side until there is evidence enough that this kick will keep the head above water without other assistance. The alternate movements of the legs should yield a steady upward pressure that will keep the body in an even position.

If he is skilled in the breast-stroke or the scissor kick, the swimmer can start out swimming and then gradually reduce the power of his pull and kick, until his legs have sunk almost beneath the body. Then the arm pull can be abandoned, and only the kick kept in action. At first the kick will seem extremely awkward, the body rising with each thrust of the legs and sagging almost under water with recovery. By gradually shortening and speeding up the kick this will be overcome, and soon only a gentle movement of the legs will suffice for the swimmer's purpose.

The Complete Swimmer

In the single scissors the swimmer need only draw the legs up enough to permit the achievement of that snap or whip which results from the extension and the squeezing action. Actually, the pedaling movement described above is merely a double scissors.

The breast-stroke kick is not like that of the frog, nor again is it purely a squeeze; it is essentially a combination of both—a whip or snap. For treading water, the ordinary full breast-stroke kick can be pared down to a series of small, effortless movements.

For practicing breathing, kicking, and treading water all in one, no exercise is better than that in which the swimmer in a vertical position takes a breath, lets himself sink a few inches below the surface, kicks himself to the top, takes another breath, sinks again, and kicks again, repeating the process a number of times.

Swimming Under Water

Swimming under water is often done with the breast-stroke kick, and the swimmer may prefer to learn this skill when he is practicing that stroke. Those who do not care for the breast stroke will perhaps prefer to use the scissor kick and side stroke for swimming under water. Others may be satisfied with combining a breast-stroke arm pull with a flutter kick.

The beginner has already been emulating the crash dive of a submarine by standing in water above his waist and trying to glide downward to a fixed point on the bottom a few feet away. He may already have learned to level himself up and down, by curving his body and shifting the angle of his arms and hands. The next step is to take

Special Skills in the Water

that same crash dive but this time help himself along with a strong pull of the arms. The palms are turned backward and slightly upward so that the force of the pulls tends to draw the body downward as well as forward. The swimmer would be well advised to keep his head up when he first tries this, so that he will not strike the bottom.

The breast-stroke kick is most serviceable in under-water swimming when combined with a long, full-arm pull to the hips. This variation of the stroke is often used by competitors who achieve considerable speed with it under water.

The timing is a bit intricate; for the arms and legs have to be recovered at the same time. Generally the arms are pulled just after the kick, the thrust of both shooting the body along like a torpedo for several yards (Figure 17). The arms are spread on the pull instead of passing directly beneath the shoulders. The kick is the combination push-squeeze of the breast stroke. To stay under water it is necessary to swim slightly downhill by exerting an upward as well as backward pull of the arms.

No special form of swimming under water is preferable to any other, and the swimmer can use any stroke which he finds best suited to his ability. Many like the under-water side stroke, combining a shortened breast-stroke arm pull and a scissor kick, and often said to be the fastest under-water stroke there is. Others may use, as suggested before, a breast-stroke arm pull with the flutter kick, or they may put a series of fluttering movements at the end of each breast-stroke kick. Many good crawl strokers after diving into the water will use their flutter kick to propel them along for ten or twelve yards under

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water before rising to the surface to begin their arm stroke.

The swimmer is welcome to any method he pleases, but is requested not to become so absorbed in his stroke as to forget to lift his head and observe whether or not he is going to bump into some obstruction.

Under-water swimming is an interesting and important skill but over-indulgence in it is dangerous. Endurance contests are to be avoided.

The Crawl Stroke

IN A RELATIVELY FEW YEARS, since about 1902, the crawl has become the world's most famous and most popular stroke. It is a direct descendant of the Australian crawl, which in turn seems to have derived from a stroke used by the natives of Ceylon and the South Seas. A version of this same crawl was popular with the Assyrians and, later, with the Romans and Greeks. Then, for a long period, it seems to have been more or less neglected in Europe until brought to England from Australia and later taken up by the competitors of this nation as the American crawl.

With certain changes, especially in the kick, the new American crawl carried a number of swimmers—notably C. M. Daniels, and after him Duke Kahanamoku—to numerous record-breaking victories culminating in the latter's famous fifty-three-second hundred-yard dash. The crawl with various developments became the favorite racing stroke, and its popularity spread to the masses, which, however, espoused it more slowly, possibly because it was far more taxing than it now is. Probably the man who did most to make the crawl popular and to send thousands to the water to try it out was Johnny Weismuller. His stroke was the American crawl at its best. It had several unique features which his coach and trainer, William Bachrach,

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and he had devised, and was a revelation of speed and gracefulness. Johnny's record-breaking career in the 1920's marked a long step in the advancement of world swimming.

The crawl to be described here is essentially a perfected version of the rough stroke most beginners learn today.

The original introduced a continuous narrow leg thrash, or flutter kick, which was combined with an overarm stroke, the head generally submerged. It was a radical departure from the side stroke, breast stroke, and the various kinds of overarm strokes favored at the time of its discovery. Since then its development has been continuous. A few changes have even been made in the strokes used by Kahanamoku and Weismuller. The arm pull and recovery have been altered so that they are, if anything, less fatiguing, and the kick has been slightly improved.

Suppleness—Relaxation

The adoption of the crawl has made swimmers cognizant of the value of suppleness and relaxation. Suppleness is the ability to move the legs, arms, and head in a liquid, easy fashion, to keep the body in proper swimming position without being stiff. It is what Father William, the Lewis Carroll character, had when he turned a back-somersault at the door.

Relaxation has almost the same meaning. It is the ability to hold the muscles no more rigid than is necessary, and to loosen them completely when they are not in use. Relaxation is the difference between tiresome and tireless swimming; without some of it a person cannot learn to swim. Without still more, a good crawl stroker is impossi-

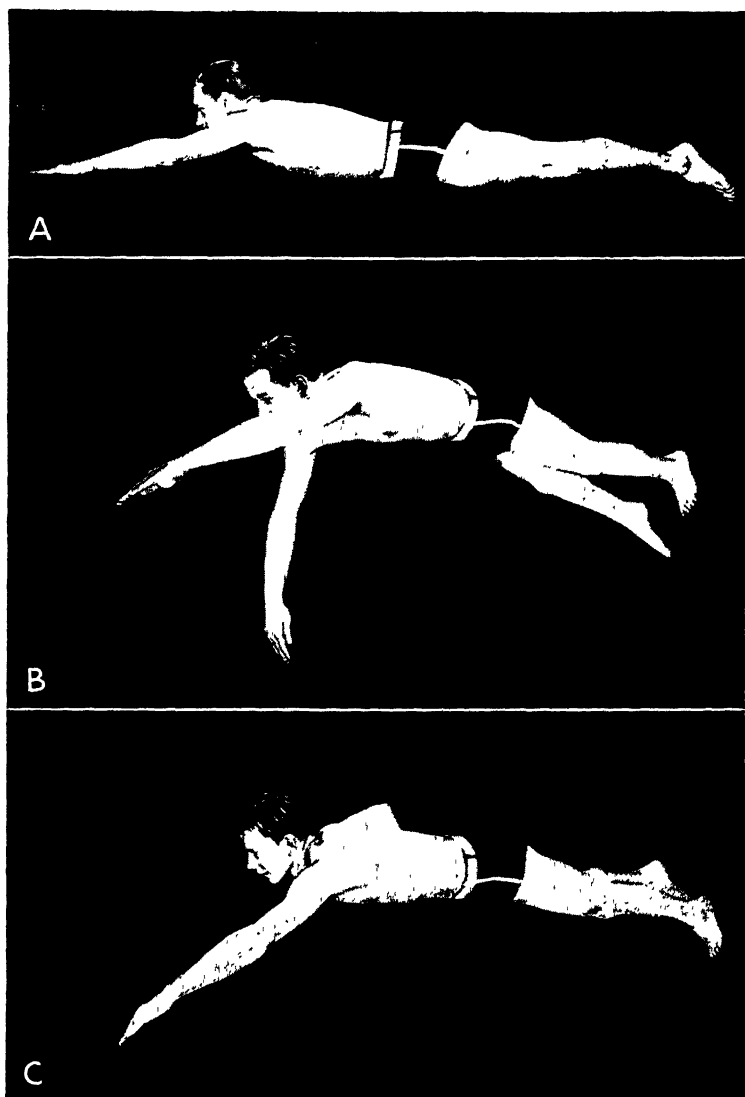


FIGURE 18. *A, B, C* (see *D, E, F, G, H, I*, pages 60 and 61).
The crawl stroke starting from the glide position, the right
arm pulling first.

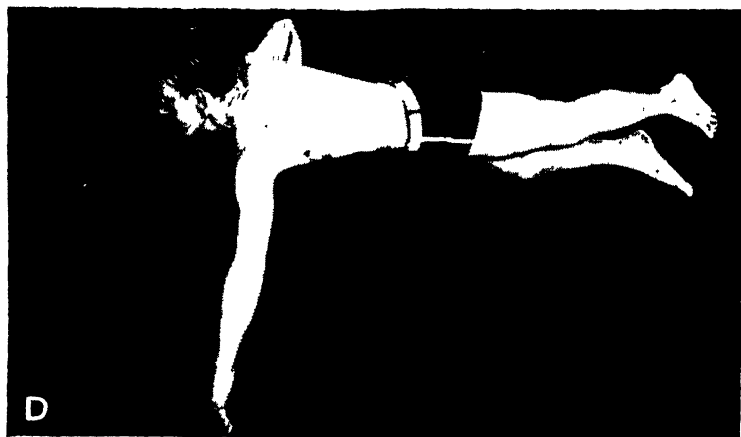


FIGURE 18 (continued).

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ble. Together, relaxation and suppleness contribute grace, efficiency, and poise.

To test his relaxation, the swimmer can extend his arm as if it were just entering the water and with his other hand feel the arm muscles. Those of the shoulder and back of the arm should be firm. The biceps and the rest should be relaxed. To test his suppleness, the swimmer can drop his arm, the wrist and forearm hanging loosely, into the water in front of the head in the entry position of the crawl. The forearm and wrist should be supple enough and relaxed enough for the water to straighten them out flat.

Swimming movements are of two types—positive and negative. The positive are the propulsive; the negative, the nonpropulsive or retarding. The crawl pull is positive from the time it enters the water. It is negative on the recovery. The kick, if performed correctly, is almost completely positive. Power is exerted in the positive movements to its fullest effect. It is conserved as much as possible in the negative, which afford some opportunity for resting.

The swimmer's general aim in the crawl will be to reduce as much as possible the retarding action of the negative recovery movements, to increase as much as possible the propulsive effect of the positive actions.

Position of the Body

In the crawl stroke the body lies horizontally on the water in whatever position is most comfortable.

Often it is arched slightly from the waist to the shoulders into a planing position that causes the water to crowd

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downward under the chest and throws the body higher. If this also causes the hips to sink too far under water or makes it difficult for the shoulders to "dig" into the pull, then it should not be attempted. A good example of the arched-body position may be seen in Figure 20.

The neck and head are on an axis with the spine, the head lifted slightly so that the water line is at the forehead. From this position, it can be turned easily backward and slightly upward to get a breath. It is pillowed in the water, the muscles of the neck working only enough to hold it in position.

To discover what position his body naturally assumes in the crawl, the swimmer can push off from the side of the pool or from the bottom in the beginner's glide position, arms and legs extended, head lifted enough for the foam to pile up in front of the eyes. When the limbs are in motion, the body should not roll at the hips. It should maintain the even keel of the glide just as does a powerboat despite the twisting of the propeller.

The Leg Drive

Although the flutter kick when first attempted may be tiring and inefficient, it will not always be so. It was at first thought to be good for sprinting but useless for distance. The fact that all the records in the mile and other long races are set by swimmers using a continuous flutter kick demonstrates how wrong was the original conception. This is the most efficient of all kicks, with negative action reduced to a minimum, and is valuable for all purposes.

In the flutter, the water is squeezed, thrust, and kicked away, imparting a forward drive. It is most effective when

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the power comes from the hip and thighs, the rest of the leg controlled but relaxed, the knees slightly bent, the ankles loose (Figure 19, A-C). The ankles may be turned slightly inward in pigeon-toed fashion and should be completely relaxed so that they flop loosely, the toes pointed to eliminate resistance.

The kick is, of course, a series of beats, the legs moving alternately up and down. As it is lifted toward the surface, the leg is relaxed at the knee and bends slightly, the bend increasing until the leg is near the surface. The downward thrust is a whiplash motion in which the whole leg is straightened, imparting a snap to the lower leg and the ankle. The effect is to drive the water down along the thighs and snap it away; or, to look at it in another way, the legs both in the upward and in the downward beat catch hold of the water and drive the body forward.

The first rule for practicing the flutter kick is to make the thighs do the lifting and thrusting. If those big muscles in the thighs and lower back do the work, the kick will not be as tiring as it would be if it were primarily a knee kick, incorrectly used by many swimmers. By applying force from his thighs, the swimmer will give an undulating movement to his legs somewhat like that of a piece of rope when one end of it is snapped. At first there should be little, if any, bending of the knees. The swimmer can let his legs twist inward slightly, rolling the knees closer together and pointing the toes inward and downward.

The flutter kick at first seems tiresome, and the swimmer finds himself unable to continue any distance without a rest. This is the time to check over the kick: Are the legs too taut? Are the calf muscles clenched tightly?

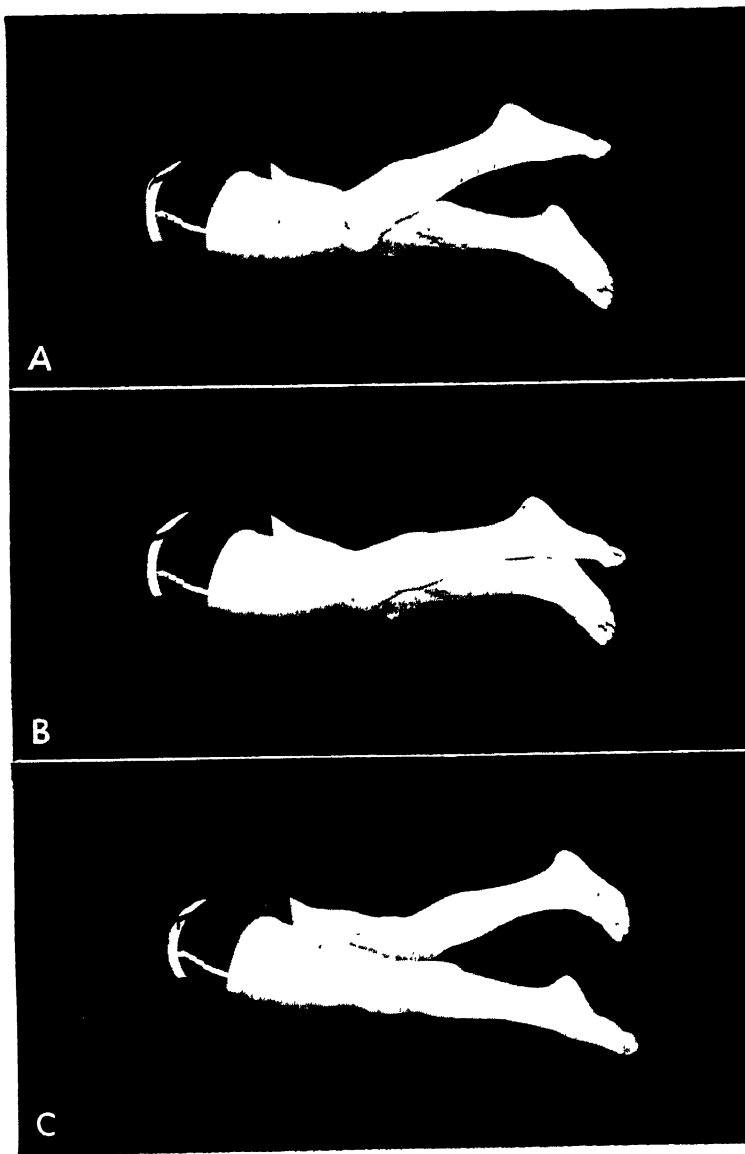


FIGURE 19. A single beat of the flutter kick.

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Are the ankles in a rigid, immovable position? Do the thighs ache? These are all signs that proper control, relaxation, and suppleness have not yet been learned.

The swimmer can increase the strength of his legs by holding onto the side of a pool or placing his hands on the bottom as did the beginner, and kicking steadily and easily, trying to strike the position in which the legs really push against the water. Some find the kicking boards extremely helpful. Any flat piece of wood carefully planed to eliminate splinters, and large enough to float the head, shoulders, arms and upper trunk, is adequate. By slanting the board under his chest, grasping the upper end with his hands, and lying prone about a third of the way up on it, the swimmer will be able to concentrate on his kicking.

In using the board, he should try to assume a natural swimming position as nearly as possible. Holding the arms stiff, the head raised slightly, and the body on an even keel, he can kick himself easily along, observing what movements are most and what are least effective. For the swimmer whose kick is strong from the first, the boards will be a remarkable aid; but for those with little or no propulsive value at the outset, the board will undoubtedly be too tedious and difficult a method of practicing.

As the leg action becomes more natural, the swimmer will gradually loosen the knee joint to permit a larger bend but will still apply the motive force at the hips and trunk. Up to a certain point bending the knees will be accompanied by increased power; but beyond that point it will cause resistance. Too great a bend permits the lower part of the leg to beat against the water and throws the whole kick out of line.

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Throughout the kick the knees are close together. Some swimmers may even prefer an interweaving motion in which the knees overlap each other slightly as they slip up and down. The ankles move in a small area varying between eight and sixteen inches. Most swimmers sooner or later fall into a kick which is best suited to their size, weight, and strength. Often too the width of the kick will depend upon how good it is. Swimmers with weak kicks often narrow their thrash to a slight, effortless movement. Persons with a powerful kick, on the other hand, may have a strong, deep thrust. A kick will likewise vary with the speed at which a person is swimming; for the faster and harder the thrash, the deeper the legs sink and the more the knees bend.

To determine the power of his kick, the swimmer can push off in the glide position, then, holding his breath, begin the flutter—meanwhile studying his rate of progress. Then let him bring his arms into use and observe what happens. Generally, the kick is fairly strong when the body is in the glide position. It loses much of its value when used with the arms. This may be due to an inability to keep the body level, which can be overcome only by further practice of arm stroke and breathing, or it may be due to lack of coordination between movements of the arms and legs.

In the crawl, the legs beat in sets of six, three kicks to each pull of the arms, six kicks to a complete revolution of the arms. Sooner or later this coordination will be learned, for it is a natural one; but the swimmer will do well at the outset to avoid any of the faster eight- or ten-beat kicks which generally are more of a hindrance than a help. Each time that he starts his leg kick, the swimmer

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can draw one arm backward slowly enough for three beats to be taken while the pull is in progress. Then, as the other arm begins its pull, the kick is continued for three beats more.

The start of the down beat of each leg always occurs with the beginning of the pull of the corresponding arm. This correlation between the movements of the legs and arms is known as intertiming, and throughout this stroke the swimmer's arms and legs will remain in the same relative positions. (Figure 18, A-I)

Although the kick usually contributes only about 25 per cent of a swimmer's motive power, it often is the determining factor in the ability of crawl stroke swimmers.

A strong kick will raise the hips and the legs to the surface and materially reduce the drag of the body. With a bad kick the legs sink, and the swimmer will be constantly working uphill. With proper relaxation, however, every swimmer can develop a kick that, if not strongly propulsive, will at least neutralize the drag of the lower trunk and legs and to that extent lighten the work of the arms.

The Arm Stroke (Figure 18, A-I)

Although the arm stroke looks easy enough, every movement should be carefully analyzed and studied to make it as efficient as possible. The swimmer has become an engineer interested in getting as much from his stroke as he can for the amount of energy he puts into it. Of all swimming strokes, the overarm best answers his purposes, for in it the retarding effect of the recovery action has been reduced to a minimum. The swimmer may test this point for himself by hooking his legs through a tube and

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propelling himself solely by his arms, first in the overarm and then in the breast-stroke movements. Progress will be possible with the former, but virtually impossible with the latter.

In recent years the approach to swimming has been on a more scientific basis, and the arm stroke has been carefully analyzed until it is now possible to describe with some definiteness the form that with certain exceptions is best adapted to the human body.

It is composed of two parts: the pull, and the recovery and catch. The pull is the propulsive stage of the stroke, in which the arm moves from a point below the surface and out in front of the head back to the hips, where it is withdrawn from the water. The movement in which the arm is lifted from the water and carried forward to be submerged again in front of the head is the recovery. The catch is the point at which the stroke begins.

The arm stroke can be started from the gliding position after, rather than before, the feet begin their kick. Both arms are stretched out in front of the head, both palms are below the surface at a depth of eight or more inches. The pull begins when one arm is drawn down and back. When this arm is ready to recover, the other arm then starts to pull. There is always one arm pulling under water while the other is returning to the pulling position, so that the swimmer never for a moment loses his forward motion; and both arms bear the same relationship throughout the stroke.

The arm is straight or but slightly bent when it begins the pull, and it remains thus until recovery. In the past, swimmers sought more speed and power by hooking the arms but it is now believed that only a slight elbow bend

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will yield all the leverage than can be handled. During the pull the arm exerts a vigorous pressure down and back for a distance of between twenty-four and thirty inches. It becomes less efficient if it swings outside the shoulder and is most efficient if angled slightly inward so that the palm almost passes directly under the center of the body. If the pull is too far toward the center, however, it will disturb the arm-stroke balance.

The point of greatest power in the pull is when the arm begins to pass below the shoulders. As it moves farther back, it is gradually relaxed; the elbow bends and begins to lift even before the pull is finished.

Most of the work is done by the shoulder, back, and pectoral muscles. To spare himself needless effort, the swimmer will wisely make certain that his biceps and the muscles of his forearms are relaxed, and that his fingers are not clenched together. The shoulder throughout the pull remains at about water level, dipping slightly with the arm but only as much as flexibility will permit. The body should not be turned to one side to allow the shoulder to drop still deeper.

The recovery is the swimmer's opportunity to rest, and he should take advantage of it. Once the arm has ceased its pull, the shoulder lifts it out of water, the elbow first, the hand following, and it is the shoulder that continues to lead and carry it forward. Nine-tenths of the work in the recovery can be done by the shoulder, and the rest of the arm can be almost wholly relaxed, the elbow bent and the forearm hanging toward the surface. When opposite the shoulder, the forearm moves ahead of the elbow, and the arm is ready to drop into the water. The important feature of this recovery is the relaxation throughout

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the arm achieved by letting the shoulder do all the work.

The advantage of this type of recovery is apparent by comparison with that more popular in the past and still used in some parts of Europe—the wide-arm recovery in which the arm was stretched out to the side, the elbow low. This position is considered more taxing because it does not permit the relaxation possible in the high-elbow recovery.

In the older stroke the arm was generally dropped into the water when fully extended, and the catch came almost immediately. Now the arm enters the water while still reaching, sliding forward palm down until it is from eight to twelve inches deep. As it slips into the water, the other arm is still pulling, with the result that the body rides forward resting slightly on the extended arm. The shoulder should be a part of this extension, but should not reach so far forward that the body twists and too much weight is thrown upon the arm.

This part of the recovery can be made a natural, effortless motion, the muscles relaxed, the arm pressing lightly on the water. Gradually, the pressure will increase as the arm sinks toward the pulling position. And finally, when the other arm begins to recover, the forward arm will be in a position to pull strongly, the body riding forward over it.

Throughout the pull and the recovery, the arms should be completely isolated from the rest of the body, except for the hard-working shoulders. Any twisting or turning to give the arms increased assistance will only impede progress, throw the body off balance and the arms out of position.

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Breathing

It has been mentioned that no matter how high or how low a swimmer is in the water, he will have to regulate his breathing to the rhythm of his stroke. Although swimmers have experimented with breathing every fourth, or even every sixth or eighth, stroke it has been found that this yields insufficient oxygen and saps energy. The most natural breathing period is on every stroke, that is, once every complete revolution of the arms. This enables the swimmer to take a short breath on one arm pull, exhale it on the next and be ready to inhale again on the following arm pull. The process is almost a continuous one of inhaling and exhaling, so that the swimmer does not have the sensation of holding his breath.

Breathing is accomplished by twisting the head about four to six inches to the side as one arm begins its pull. The position of the head is important, for if it is rocked too far to the side or lifted upward the body will rock or lift with it. The mouth need not be lifted above the surface. The nose and side of the head pushing against the water create a tiny pocket in which the swimmer catches a quick breath before returning his head to its forward position.

Although the high-held head used to be popular, especially in Weismuller's day, it is no longer considered necessary. The swimmer can drop his head naturally in the water, thrusting the chin somewhat forward away from the chest, bringing the water line about halfway up the forehead. A light, buoyant person will be able to hold his head higher than a heavier person, who if he lifts his head too

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high, will suffer from an excessive arch in the back and strain on the neck.

The head always breathes away from the arm that is pulling. With the left arm pull the head turns to the right and vice versa. The head does not twist for a breath until the arm is anchored well out in front in the beginning of the pull. The breath is just a brief gulp and does not last for the duration of the arm pull; the head may quickly recover its original position or may return slowly as the alternate arm recovers.

When the alternate arm enters the water, the breath is expelled—but not too rapidly, for this will exhaust the lung supply. A small amount of air should be gradually released until the swimmer is ready to breathe again. In exhaling under water, the swimmer's lips are slightly parted, and the air is blown out of the mouth and nose at the same time, the greater volume from the mouth, followed by a quick puff from both nose and mouth just before the head is turned to inhale. This clears the nose and mouth of drops of water before another breath is taken.

Putting these instructions into actual practice, let the swimmer start from a glide position, pull with one arm (call it the left, although it can be either); then, as this arm begins to recover and the right begins its pull, let him slowly twist his head sideways to the left until the mouth is clear of the water, when a quick gulp of air is taken. The head then drops back into position, the left arm enters the water, the swimmer slowly exhales until the completion of the left arm pull and the catch of the right arm, when he again turns his head. It should be an easy rhythmic motion, and need not be accomplished by rolling the body.

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There are several ways to practice the crawl arm stroke and breathing, such as by hooking the legs in a ladder or in some way propping them against the side of a pool or any other support. The most popular device, however, is the small tube through which the legs can be inserted and thus supported motionless on the surface while the arms are in action. This aid is furnished by almost any manufacturer of sporting goods. The swimmer will find that use of the device throws the head and shoulders lower into the water, making breathing quicker and the stroke faster. It is an excellent means of strengthening and improving the arm stroke.

The swimmer has now learned the proper form in the kick, the arm stroke, and the breathing. He has discovered how the arms should be coordinated with each other and how the breathing should be timed with the arms. He has learned what position the body should maintain, and he has found that relaxation and flexibility are the keynotes of a good crawl stroke. The one element still missing from this smoothly working machine is the all-important one of coordination between the arms and legs.

The timing of this stroke has already been partly discussed in the description of the leg motions. It is fundamentally the maintenance of a three-beat leg kick to each arm pull, a six-beat kick to two arm pulls or to a complete revolution of the arms. It is natural for man to coordinate the arms and legs when they are in motion. Without conscious effort most persons as they walk swing their arms rhythmically with each step. So, when in the water the arms start to revolve and the legs to kick, sooner or later a definite rhythm will be established between them. Until



FIGURE 20. The arched position in the crawl stroke.

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it is, however, the swimmer's stroke feels awkward, as though some of its parts were still missing. Mastering co-ordination is often easier if the swimmer, while practicing his kick, counts each beat in groups of six, thus: "One, two, three, four, five, six; one, two, three, four, five, six." Then, if he continues to count when he begins to use his arm stroke, the legs may slip into this rhythm quite naturally.

When he was learning to swim, the beginner had a definite objective. Learning a skillful crawl, however, is a continuous process of improvement. The swimmer's goal now is a relaxed, effortless stroke that will feel good and look good, that will carry him speedily or slowly through the water for any reasonable distance.

If the stroke seems complicated and difficult, the swimmer should bear in mind that it is not to be learned piecemeal, nor is perfection to be achieved all at once. He may help himself by trying to get a mental image of the requisites of a good crawl.

Thus in his mind he will have a picture of the position of the body, horizontal and slightly arched, the top of the head a little higher than the line formed by the spine and neck. The body will be on even keel, varying its flat position but slightly with the arm stroke and breathing.

The arm stroke should be seen as one continuous motion, with the burden of the stroke resting upon the shoulder. The pull is slow. The recovery is high, the elbow close to the body.

The burden of the kick is carried by the thighs and lower trunk, the legs relaxed. The kick is a continuous motion, the legs barely breaking the surface of the water and sinking to a depth of about eighteen inches.

The Crawl Stroke

The breathing is also a continuous, rhythmic inhaling and exhaling as the head twists to the side and back in accord with the movement of the arms.

If the swimmer bears in mind the fact that the best stroke for him is the one he swims most naturally, then he will not be straining at strange and awkward positions. The fundamentals given here will serve as a basis for the development of a crawl stroke that is the swimmer's own just as a particular style of walking is his own.

Free Style: A Faster Crawl

THE PHRASE "FREE STYLE" literally means just what it says, free style—any style of swimming. It is the name for those competitive events in which any type of stroke can be used, and as a consequence has come to be another name for the crawl stroke, to date the fastest way of getting through the water.

This free style, or modern crawl, embodies a series of changes made since 1932. Until that time the Americans had been swimming a crawl corresponding roughly to that described in the previous chapter. It was a modification of Weismuller's stroke and was quite satisfactory to the Americans inasmuch as it had established them as world swimming leaders for a number of years. And then in momentous 1932 America's best competitors, entering the Olympics in California with high hopes, were defeated on every hand by a team of fast Japanese, with revolutionary ways of swimming the crawl stroke, the backstroke, and the breast stroke.

They had developed a whole new set of principles in crawl stroking. They held their heads high and rode high on the water, supported partly by a fast arm stroke in which the arms pressed against the water as they moved to an extended position for the catch. Their pull was ex-

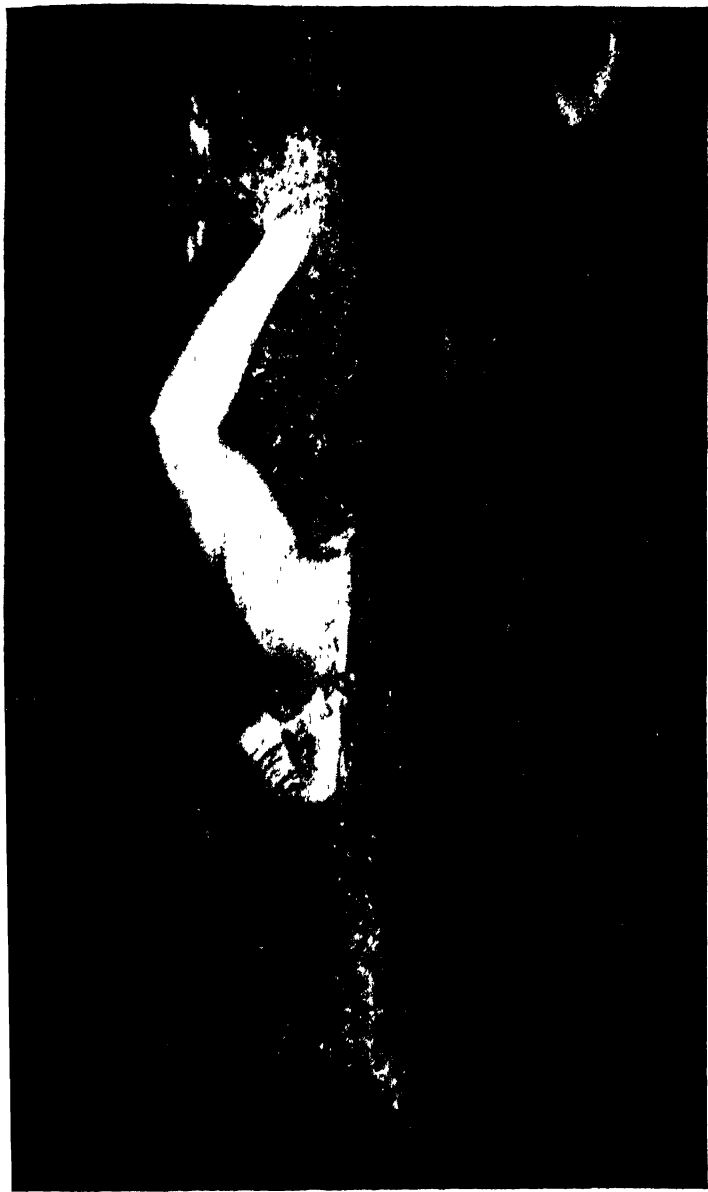


FIGURE 21. A fast free styler. The shoulder is leading the arm out of the water. Breath is caught

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tremely short. They had perfected what is now known as⁴¹ the fast recovery—the most important innovation in over-arm swimming in recent years—which enabled them to have two arms in the water simultaneously most of the time.

Although in the years following 1932 the American crawl stroke changed radically as a result of this new influence, the Japanese crawl was never accepted *in toto*, the Americans tending to go their own way, perfecting a stroke they thought was better suited to the American body. It was wisely decided that a stroke suited to the small, lithe Japanese with his highly flexible arms, legs, and hips was not necessarily one that the big-boned American could readily adopt. What finally resulted was a compromise between the original American crawl and the new Japanese crawl; and with this stroke Jack Medica proceeded to break many of Johnny Weismuller's records.

Although it is possible to swim the free style with the body well arched and high in the water, it is not necessary to do so; for many it will be a strained and fatiguing position. Sprinters driving hard with their legs and arms often ride higher than is customary. Although both Weismuller and the Japanese preferred to hold the head high, that too is no longer necessary. To repeat the instructions of the previous chapter, the head should be "pillowed" in the water.

The Quick Arm Recovery (Figure 22, A-I)

The difference between the so-called "quick" and normal recovery is simply this: In the latter, the arms throughout the stroke bear a corresponding relationship,

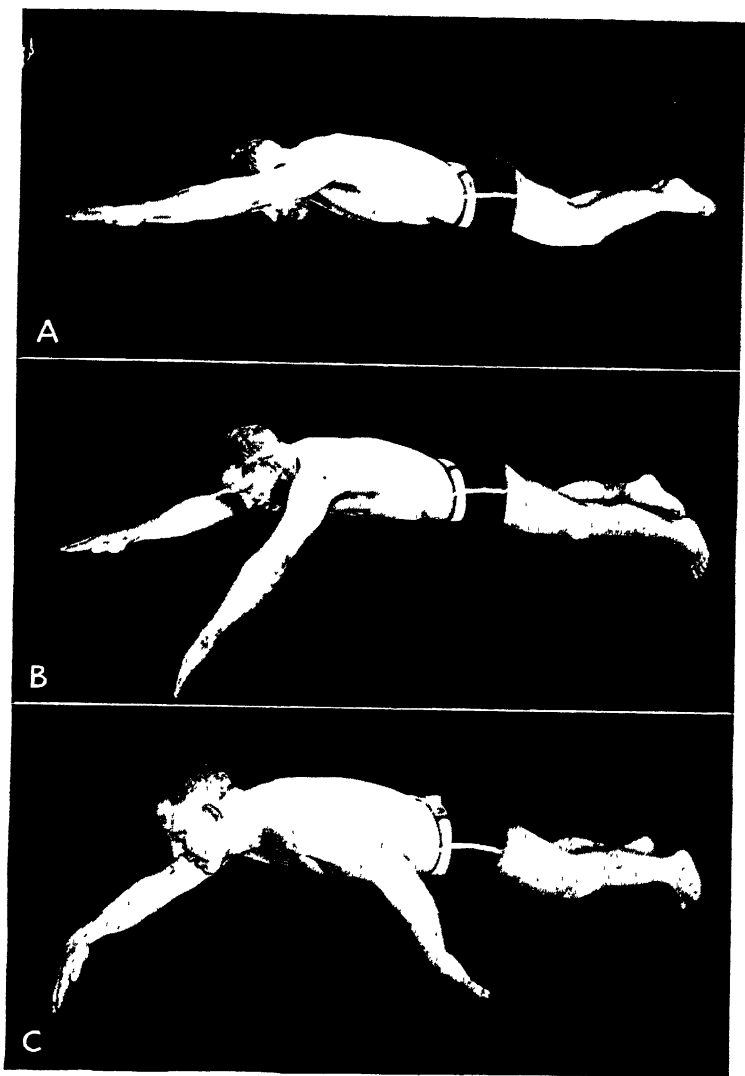


FIGURE 22. *A, B, C* (see *D, E, F, G, H, I*, pages 82 and 83). Free style with fast arm recovery, starting from glide position. Note in Figures *D* through *I* how upper arm is flipped quickly forward. In *G* (page 83) both arms momentarily pull together.

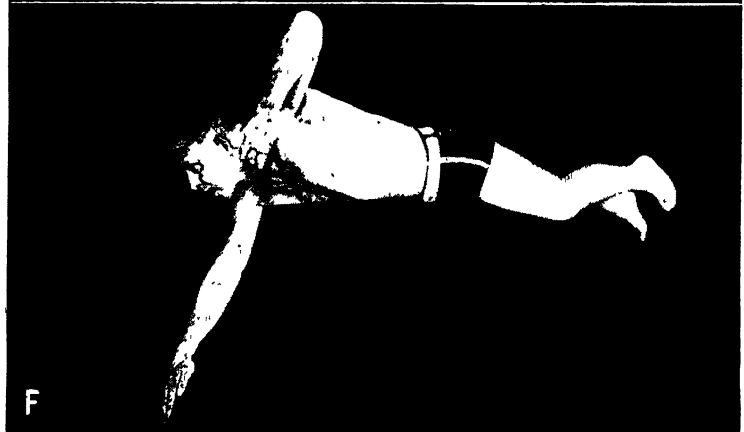
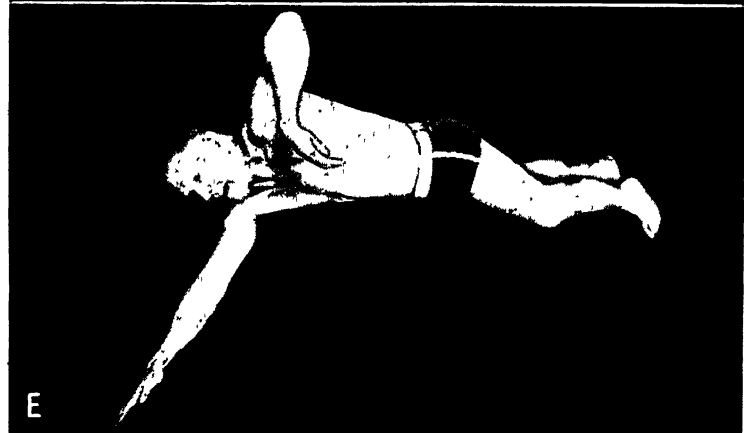


FIGURE 22 (continued).

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just as if they were joined in a fixed position on an axle extending through the shoulders. In the quick recovery, this relationship is broken. In the older stroke, the recovery was made at the same speed as the pull and consequently was rather slow. In the free style, the recovery of one arm is considerably faster than the pull of the other arm, so that one is always in the water before the other ceases pulling. This gives a lift and balance to the body.

The quick recovery is an excellent means of conserving energy. Less effort is required to flip the arm forward than to carry it there slowly. Furthermore, it eliminates trunk and shoulder roll, permits the arms to be relaxed and helps to isolate them from the body. Bringing the weight of the arm forward past the shoulder as rapidly as possible undoubtedly facilitates forward progression. All in all, speed helps to diminish the negative or retarding action of the recovery.

The fast recovery is also advantageous from a propulsive standpoint. By bringing both arms under water at the same time, it releases more power because for a fraction of a second both are pulling simultaneously. It distributes the drag of the body and the burden of propulsion more evenly to both arms, shifting it quickly from one to the other, whereas the slow recovery puts added weight on the arm driving under water. Two arms are better than one, and the nearer they come to doing the job together, the easier the stroke, the faster the swimmer. (Figure 23, A-C)

The pull is short—only about eighteen inches long from the time the arm catches until the beginning of the recovery. The arm is then relaxed, bent at the elbow and whisked out of the water and forward again.

In the main, the kick that accompanies the free style is

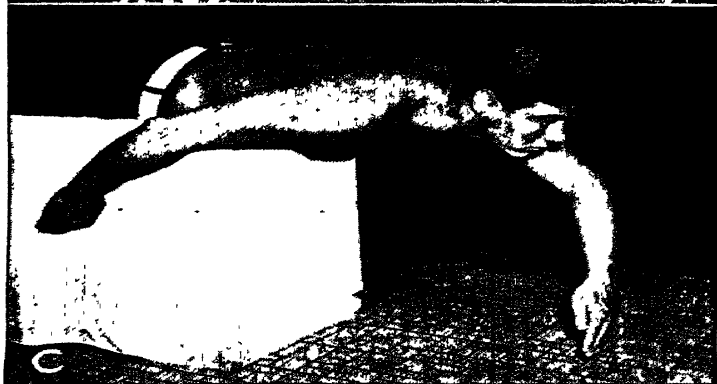


FIGURE 23. Demonstrating an overlapping short arm pull.

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narrower in scope and faster in action than before. The shorter and quicker arm pull calls for a correspondingly shorter and quicker kick. It was the Japanese again who demonstrated that the kick could be speeded up successfully to conform to this arm action.

Breathing is completely isolated from the arm stroke. The head is turned to the side for a breath and then immediately returned to its original position, regardless of the position of the arms. Some swimmers keep their heads constantly in action, swinging from one side slowly to the other, as this seems to give them better balance. Their breathing will continue to be on alternate strokes but may be on either side.

Isolation of Arms, Legs, and Head

This brings us to the newest development in modern swimming—one that is little appreciated by the public in general. In the chapter on the crawl stroke it was pointed out that the stroke is coordinated throughout. The head, the arms, and the legs all bear a constant relationship to one another. This is what is known as intertiming. This is what the beginner spent so much time in learning when he was trying to coordinate the arms, legs, and breathing in an elementary crawl. With the quick recovery, intertiming is to a certain extent disregarded.

What the new free style emphasizes primarily is the isolation of the arms, the legs, and the head into independent working units. Isolation of this sort helps to prevent rolling and twisting. The steadier the body is, the more easily it slips through the water.

The quick recovery can be practiced in several ways:

Free Style: A Faster Crawl

from a standing position on land; from a similar position in the water; and with a tube. The form is the same as in the old crawl stroke. The elbow is high, the shoulder does the work, and the forearm is held loosely in virtually a perpendicular position. This time, however, as one arm finishes its pull, the swimmer tries to flip it forward into the water as rapidly as possible. It remains in this extended position and does not catch until the completion of the pull of the other arm.

Again, in this as in all strokes the swimmer wants to make these motions as natural and effortless as possible. The change to the free style can be made slowly in a gradual evolution of movements. First the arms are recovered slightly faster than usual; then the swimmer accustoms himself to having both arms submerged at the same time and learns to coast on the forward arm. Next, the pull is gradually shortened until effort is concentrated over a small area. The outer arm catches and pulls just before the other arm starts to recover. The swimmer tries to keep his body in a steady, not too stiff, position. Finally, the kick may have to be speeded up, but not at a sacrifice of power.

Backstroke: The Comfortable Back Crawl

THE MODERN BACKSTROKE, or back crawl, is a combination of the overarm action with a flutter kick and provides all the comforts of swimming on the back in addition to being powerful and speedy. It is of the same species as is the crawl stroke. The negative, recovery motions are not excessive, and the movements are continuous. It is really an inverted crawl, involving with certain adjustments the same coordination between the arms and the legs.

The back crawl is a relatively new stroke, developed through competition, and consequently has been less popular than it deserves to be. It has a number of advantages that would make it a favorite if more persons would learn it. In the first place, it permits the head, nose, and eyes to be carried clear of the water. It is also easy to learn, first, because the actions are relatively simple, and second, because the swimmer is in a better position to study his movements, particularly the recovery of the arms, than in some of the other strokes.

Although mankind has long been loafing through the water on his back, the strokes used have been in the main under-water arm strokes of the paired variety with a scissors or breast-stroke kick. There are a number of strokes of this sort; but none of them has the speed, power, or



FIGURE 24. The graceful back crawl.

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value of the back crawl. This is now a standard racing stroke, although it is by no means as speedy as the crawl and is only slightly faster than the breast stroke. A good backstroker can swim a hundred yards in about 65 seconds whereas a good crawl stroker can cover the same distance in about fifty-four seconds. For distance swimming, however, the backstroke is almost as good as the crawl, and there is no reason why those who find it a more natural medium should not make it their favorite.

Some swimmers, when they first turn on their backs, may find the position unfamiliar and disturbing. They may even have a sensation of dizziness, from straining the head too far back in an endeavor to keep afloat. In this case, if the beginner lifts his head so that he can see his feet in the water, he will be more comfortable.

This is the position the head maintains in the backstroke. The rest of the body should be almost straight and inclined at a slight angle toward the feet. A slight arch from the neck toward the waist enables the swimmer to plane more easily. To assume this position, the swimmer can stand in water about up to his chest, push backward in the water, inclining the head forward enough to watch the hips and legs come to the surface.

The Kick

As with the crawl kick, the drive comes from the hips. Although many swimmers early learn a form of the flutter while swimming on their back, often this is marred by a tendency to bend the knees too much, with most of the propulsion coming from the lower leg rather than from the leg as a whole. Some kicks of this sort are quite effec-

Backstroke: The Comfortable Back Crawl

tive; but when put to use with the overarm stroke they provide too much resistance and make coordination more difficult. The best backstroke kick shows an undulating motion from the thigh, the feet pedaling downward and scooping upward.

The legs are held somewhat stiffly at the start. As suppleness increases they begin to "feel" the water, and the knees are unhinged. The toes turn slightly inward to help loosen the muscles of the ankles. The legs squeeze and the ankles scoop the water away.

To practice the kick, the swimmer can lie on his back in shallow water, both hands on bottom and, supporting himself thus, thrash his legs slowly up and down in a shallow kick. Starting with both feet a little more than twelve inches under water, he can move first one of his thighs to the surface, the knee bending as he does so, the shin following. When the thigh drops for the down beat, the rest of the leg straightens. The legs move alternately, and each time the ankles pass each other constitutes a "beat."

As a next step, the swimmer can push off on his back, scull the arms at the side to bring the feet to the surface, and begin a slow kick, trying to feel the pressure of the water against the legs. Or, the arms can be stretched out overhead, thumbs locked, and only the legs used. With increasing proficiency, less effort is required to keep the legs on the surface, the kick becomes less tiring, and the body begins to glide swiftly along. About this time some effort should be made to adjust the position of the hips. Too deep a hip line causes a drag, while one that is too high throws the head and shoulders too low. The swimmer will find it comparatively easy to adjust his hips at different levels, until he strikes the one which permits the best kick.

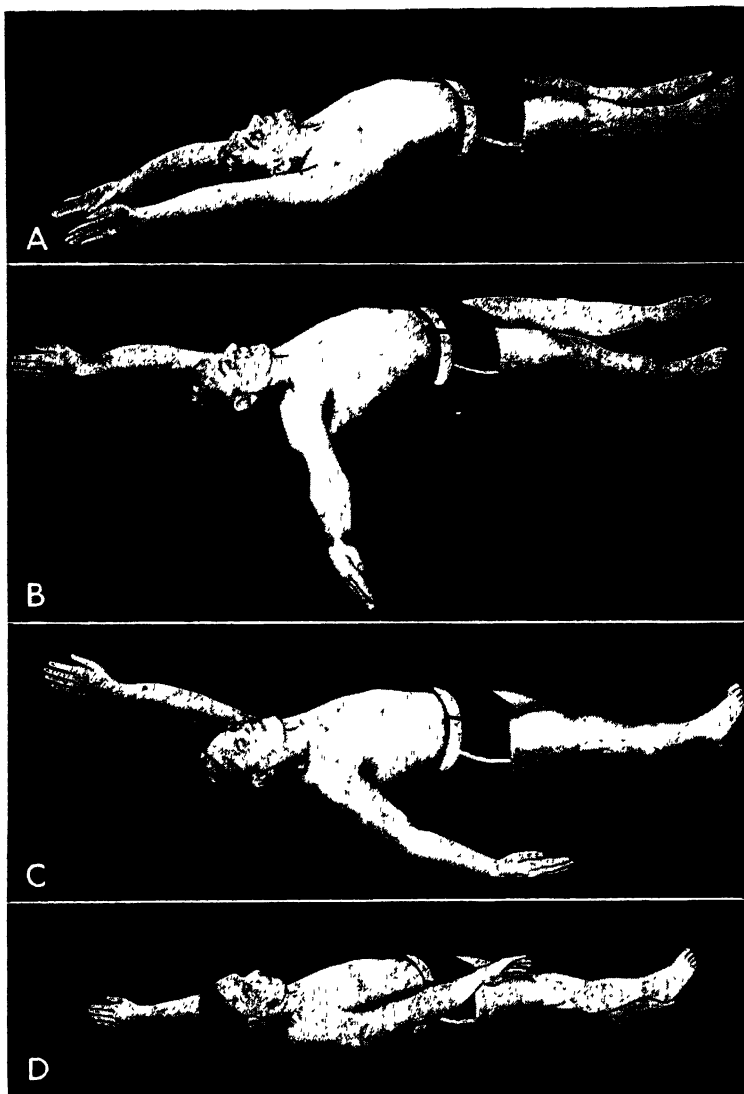


FIGURE 25. *A, B, C, D* (see *E, F, G, H* on opposite page),
The backstroke, starting from the back glide position, right
arm pulling first.

The Complete Swimmer

The Arm Stroke (Figure 25, A-H)

The arm stroke is relatively simple, consisting of a pull from an outstretched position behind the head to the thighs and a recovery from the hips overhead to the forward point of entry. Although in the crawl stroke the swimmer first mastered the coordinated recovery before shifting to the quick recovery, the latter can be used from the beginning.

The swimmer can start from a glide position on his back, arms outstretched behind his head, legs kicking. One arm is then drawn backward to the thigh and recovered forward into the water while the other arm is still pulling. The circular pull is a long arch outward, and back to the hips. The elbow bends slightly in the last quarter of the pull, enabling the swimmer to get greater leverage on the water and to relax more easily into the recovery. Power is exerted primarily by the back and shoulder muscles and the extensor muscles of the arms.

There is no necessity for pulling too deeply. The arms are sunk just deep enough to give the leverage the swimmer can handle with comfort and speed. When the arm is fully extended to the side at right angles to the body, it is seldom more than twelve to fourteen inches below the surface. Any effort to achieve greater depth will cause the body to roll and will retard progress.

As the arm nears the thigh, hand and forearm are relaxed. As it is about to leave the water, the hand gives an extra small flip which helps to keep the body in progress during the catch of the opposite arm. It is a sort of link intertiming the two movements. At its conclusion, the thumb is snapped inward and downward, the whole hand

Backstroke: The Comfortable Back Crawl

and wrist revolving with it, and the little finger leads the way out of the water into the recovery.

The backstroke permits two types of recovery, one with a straight and one with a bent arm. Either is acceptable, although in learning the stroke the straight arm is probably preferable, if only because it is easier and coordinates more naturally with the leg movement. The hand lifts high above the water, swinging above and slightly to the side of the head, the arm passing close by the ears. The little finger leads the way, with the whole arm twisted outward, the palm away from the face.

There is every reason why this recovery should be a graceful easy motion inasmuch as the swimmer can watch his arm from the time it leaves the surface until it passes into the water behind his head.

An alternate motion resembling the fast recovery used by the Japanese in the crawl may also be tried and, if found acceptable, put to regular use. In this, the elbow remains bent and is never lifted very far above the water. Entry is achieved by whipping the forearm rapidly forward, straightening it, and going into the pull.

This method has certain definite advantages. It makes for extreme relaxation of the arms, enables the body to stay flat on the surface, and eliminates some of the retarding action of the slow recovery. For many, however, it will prove ungainly and difficult to manage. The arms enter the water almost directly behind the shoulders. The small finger leads the way with the wrist hooked downward slightly. Just before entry the arm is almost fully extended with only enough elbow bend to prevent overreaching and strain. The catch takes place about three inches under water.

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In breathing, the backstroker inhales during one arm pull and exhales with the other, seldom experiencing difficulty since the nose and mouth are almost always above water.

Faults to Be Avoided

The temptation to rock the head from one side to the other with the entry of each arm should be resisted. Although this may feel right, it destroys the flat position of the body and causes the arms to be thrown too rapidly and too deeply into the water, so that they catch badly. Dropping the head too far back will have a similar effect. Once it falls below the line of the back and the neck, lack of balance and faulty breathing result, and the planing position is spoiled.

Recovering the arm too far inward over the center of the body and face also has the effect of raising the shoulder and unbalancing the body. It not only looks ungraceful but splashes water in the nose and mouth, hindering breathing. Furthermore, it causes the arm to be thrown into the water directly behind the head, which in the opinion of most authorities is awkward. The true pull of the backstroke is a continuous sweeping motion.

In learning the backstroke, then, the swimmer can watch for these easily discernible faults: bad recovery in which the arm passes too far inward and enters the water too close to the head, upsetting equilibrium; improper head position with the head too far back or too high; nodding the head from side to side with each stroke; dropping the arm too deeply on the pull.

The more inefficient the kick, the more the swimmer

Backstroke: The Comfortable Back Crawl

will have to rely upon his arms; and the more he relies upon his arms, the more his body will have to roll. The backstroker can see that this is necessary if he slips a practice tube around his ankles and then tries the alternate overarm stroke. The motion will be extremely awkward, pulling the body from side to side. This indicates that the kick not only is for propulsion but also acts as a keel, balancing the body and steering it in a straight line.

The Breast Stroke

THE AVERAGE PERSON used to think of the breast stroke as a slow, untiring series of movements in which the arms were moved vaguely in front of the chest, the head held out of the water and the legs kicked like a frog's. Recently so many new variations of this stroke have come into use that there is no little confusion as to just what it is. "Breast stroke" is a definite term for a specific set of motions. It means swimming on the breast, the arms and legs executing paired motions to each side of the body, arms extending straight to the front in what is termed the "glide" and pulling back to the shoulders so that the swimmer rides forward on his chest. This is the method to be discussed here.

The breast stroke is like the side stroke and trudgen and unlike the crawl stroke and the back crawl because of its strong negative or retarding motions. It lacks the efficiency of the last two but is superior to the first two in general grace and utility. It is slower than the crawl and slightly slower than the backstroke. Speed in it is also less constant.

If this comparison places it in a rather unfavorable light, let it be borne in mind that its valuable points are many, not the least of which are its grace and ease. It has re-

The Breast Stroke

mained in competition because its attractive points outweigh its slowness. Historically, it was a functional stroke of value to soldiers transporting their heavy, fettering armor. It is a favorite with those who dislike the splashing overarm exertions of the crawl. It will always be serviceable for long swims, particularly in rough water where its strokes can be easily matched to the waves. Some like it because it enables the head to be held out of the water, thus making for sociability between persons swimming together. It is a good lifesaving stroke because it permits a swimmer to keep his eye on the person in distress, and because its strong kick allows a swimmer to use both hands in a head carry. A tired swimmer can stretch out his hands to a breast stroker's shoulders and be pushed easily to shore.

It is a popular stroke, but, contrary to popular notion, it is not the easiest stroke of all to learn. Experience has shown that the careful timing and delicate relaxation it requires are harder to achieve than the rudimentary rhythms of the crawl stroke.

Careful practice is necessary to reduce the hindering motions of the arms and legs to a minimum and to avoid awkwardness and slowness. To be swum correctly, the arms are moved simultaneously and in corresponding ways. The same is true of the legs. The body remains on the same plane, the shoulder line level with the water and the head pointing straight ahead. Neither the legs nor the arms break water, and when in the glide it should be possible to draw a straight line from the hands to the feet.

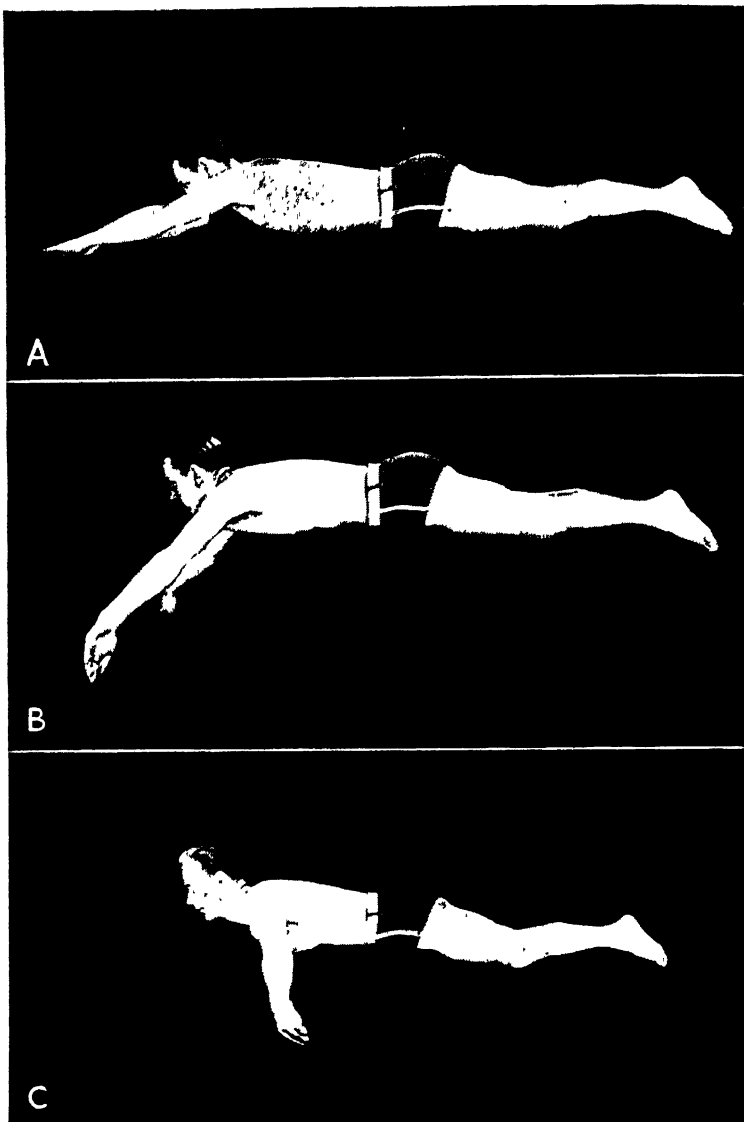


FIGURE 26. *A, B, C* (see *D, E, F, G* on opposite page), The breast stroke, from glide to glide.

The Complete Swimmer

The Glide (Figure 26A)

In this, as in other strokes, the starting position should be the glide, with the arms outstretched in front of the head, palms parallel to the surface, thumbs touching and the elbows as close together as possible, the hands from six inches to a foot below the surface. This position is the beginning and the end of the arm stroke and kick. In it the swimmer can achieve more streamlining than is possible in any other stroke. The body is stiffened into full extension, the arms forming the cutwater, the elbows and knees locked and the ankles pointed.

Arm Stroke (Figures 26 and 27)

The arm stroke has three parts: pull, recovery, and thrust. Although the length of the pull will vary with different swimmers, in general it is most effective when it starts from a point about six inches under the surface and moves downward, sideways, and backward to a point roughly eighteen or twenty inches deep. At its beginning the palms are angled slightly sideways, so that a better grip on the water is achieved. When they are about opposite the shoulders, the whole arm is relaxed, the elbows bending and the forearm moving to a position beneath the chin. From this point the arms are extended as if they were being squeezed through a small tube.

The breast-stroke pull is powerful, and the leverage that can be obtained considerable. The strain on the arms is tiring unless the swimmer learns complete relaxation during the recovery.

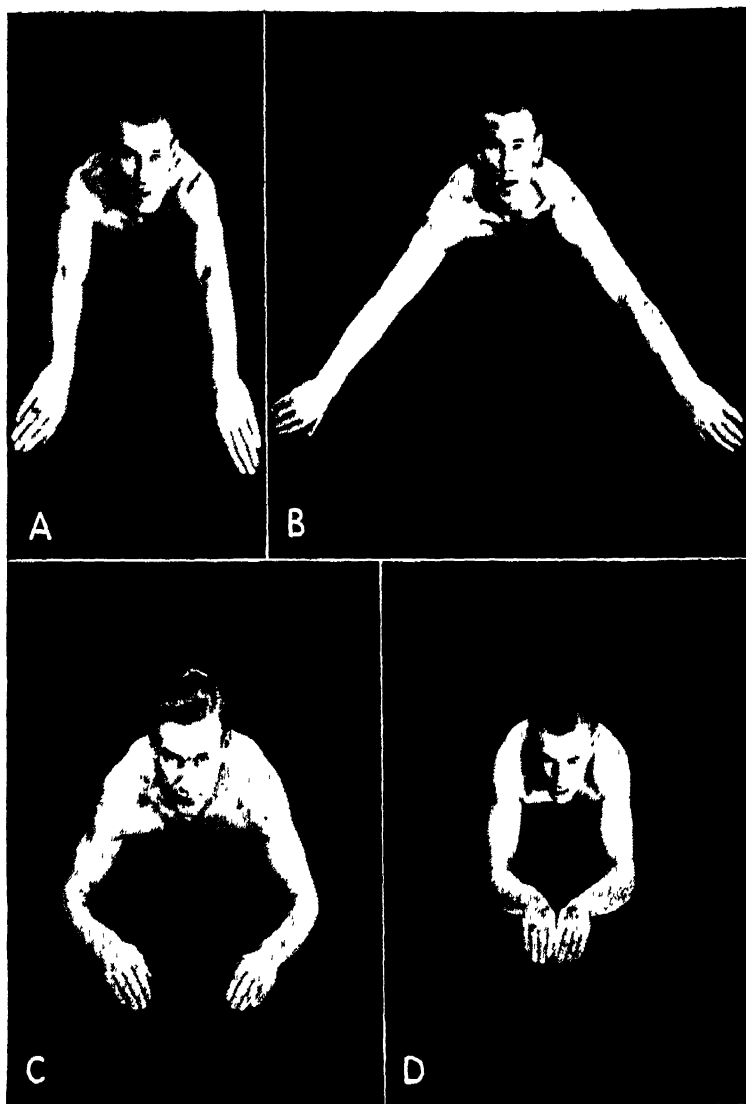


FIGURE 27. Front view of breast-stroke arm pull, correlating with Figure 26, *B, C, D, E*.

The Complete Swimmer

Breathing (Figure 27)

Breathing can and should be a natural phase of the stroke. Inhalation occurs simultaneously with the catch; exhalation, with the thrust. The swimmer may prefer to think of pulling the air in with his arms and then blowing his arms out front. The difficulty is to get a breath without raising the head too high out of the water, thus upsetting balance. After a while, a slight upward tilt will be found sufficient for a quick intake of air. The breath is then held until the thrust, when it is expelled through the nose and the mouth. Although it is possible to turn the head to the side to breathe, this will eventually upset the equilibrium of the stroke and should be avoided except in extremely choppy water.

The Kick (Figure 28, A-F)

The arm stroke and the breathing are fairly easily learned because the swimmer can watch what he is doing, but the leg kick is more complicated.

All kinds of breast-stroke kicks have been in vogue; but one has proved to be superior to all others. Lacking the frog's long slender legs and big webbed feet, swimmers have found the straight thrust or frog kick of less value to them than other combinations of movements. Many have employed a scissors kick, which does not belong with the breast stroke because it requires that the hips be twisted, thus throwing the body from its level plane. Others have preferred to spread the legs as far apart as possible and then to squeeze them mightily together, a

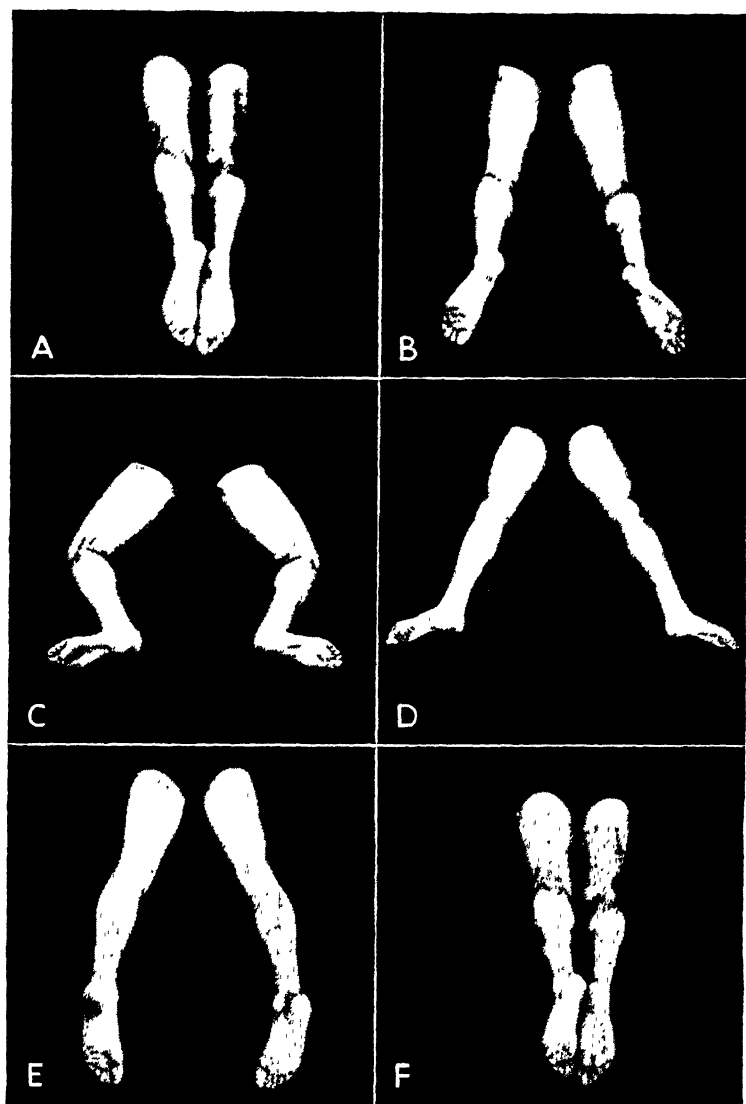


FIGURE 28. Breast-stroke kick from extension to full recovery (C) and back to extension. Thrust and squeeze are shown in D and E.

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motion which may be more satisfactory than the frog kick but is not all that can be desired.

The best kick is a combination of the frog thrust, a squeeze, a flip of the ankles for good measure and sudden relaxation at the end of the kick so that the legs float to the surface as the body surges ahead. Like the arm stroke, the kick starts from the extended or glide position and returns to it. The knees are bent and drawn downward until perpendicular below the hips, the lower legs trailing relaxedly behind, ankles and calves loose. At the maximum point of recovery, the knees spread a few inches, the feet are raised at the ankles to present a flat surface against the water and a thrust is made backward and outward.

With full extension the legs are then squeezed together, toes pointing, the whole leg swiveled inward from the hips. The high point of the kick, the moment when the swimmer surges forward, is the flip that results when the thrust becomes a squeeze. Almost immediately the legs are relaxed so that they drift together and float to the surface—a movement which continues to send the swimmer ahead.

The recovery should be the lightest, most delicate operation possible, for, as already pointed out, this is a strong negative motion that almost brings the swimmer to a complete stop. It should be slow rather than jerky and so timed that there is no pause between full recovery and the beginning of the thrust.

The movements of the recovery, thrust, and squeeze all flow into one another. Greatest power is exerted in the flip that begins the contraction of the legs.

The swimmer should practice the kick slowly at first. This can be done by holding onto the side of a pool or dock or by bracing the hands on the bottom and concen-

The Breast Stroke

trating on each movement. The aim is to feel the legs "grab" the water at the end of the thrust. To study the leg movements, the swimmer can hold onto the side of the pool and, letting his body sink gradually under water, use this kick to bring him to the surface.

The relative value of the kick and the pull can be tested by first using the arms alone while dragging the legs in a tube and by next using only the legs while supporting the rest of the body with a kicking board. The swimmer will notice that this arm stroke gets him nowhere. He will find progression possible with the kick, but in halting fashion. It is only when the movements of the arms and legs are coordinated that the retarding effect is considerably reduced.

Coordination (Figure 26, A-G)

To get the most out of the pull, the legs should recover when the arms do. To get the most out of the leg drive, it should coincide with the extension of the arms. Full coordination is something like this: From a glide position, legs extended behind in streamlined fashion, the pull begins. At its end and during the arm recovery, the legs also begin to recover, the hands still maintaining a slight pressure on the water to prevent the body from falling backward. When the hands are under the chin the thrust of the leg begins; and when the hands are stretched out front the kick is completed. The whole stroke is a continuous motion from the glide position back to it, with greatest speed coming in the glide. Here the body rides through the water, foam piling around the eyes and curling over the back.

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This series of movements can be practiced on land. In a standing position with the feet turned outward as far as possible and about a foot and a half apart, the swimmer can drop to a squatting position, then spring erect, shooting the arms overhead as he does so. It is also possible to work the pull into this exercise.

The body position in the breast stroke is the natural one assumed when the swimmer pushes off in the glide. The head must be raised slightly, but not so much as to cause the shoulders and trunk to strain upward. If the head is held too low, bobbing will result; and this can be the ruin of many a fine breast stroke. Extreme recovery of the knees is to be avoided, for it will cause the back to bend and the hips to fall. Although the back should be flexible, buckling it to achieve greater leg recovery is not generally of any help. The flatter and steadier the trunk, the less its resistance to the water.

The stroke just described emphasizes the glide, and for ordinary everyday swimming, no stroke could be more enjoyable.

To speed up this set of movements, the glide is shortened until it lasts no longer than it takes to extend the arms forward. Instead of holding this position, the swimmer begins his pull at once, so that the arms are in continuous motion. The legs continue through the same cycle although the recovery is shorter. Some swimmers like to break the extension of the arms directly into the pull so that there is no glide at all. This is especially handy for those whose kicks are not too strong.

Another form of the breast stroke with which most per-

The Breast Stroke

sons have little success is the so-called German style, in which the arm pull and the kick are simultaneous. Although this shoots the body through the water like a projectile, the gain in speed is lost in the recovery of arms and legs. The body comes to a full stop and may even sag backward a bit. It is interesting to try the breast stroke with a full arm pull which carries through to the thighs, although there will be difficulty in recovering the arms from this position. With this type of pull, the glide occurs when the arms are at the hips. They are held in this position for a moment as the body coasts ahead.

The swimmer may observe that his stroke is faster under water than on top. Under water he can pull as hard as he desires without fear of disturbing body position and without the necessity of coordinating breathing.

The Butterfly Stroke

THE DOUBLE OVERARM breast stroke is a recent innovation developed by breast-stroke competitors who decided to emulate their brother free styler. Breast stokers first tried the overarm reach in their turns and found it quicker and more convenient. Further attempts at making it part of the regular breast stroke showed its speed. Gradually, swimmers improved the technique until now many of them can swim two hundred yards at racing speed with it. Only a few strong lads can swim it much farther although some have been able to use it for over a mile.

This stroke is often called the "butterfly stroke," possibly because the recovery of the arms looks like the flapping of a butterfly's wings, although it actually should be classed as a form of the breast stroke and is used as such in swimming meets. Its essential difference from the orthodox form previously described is the recovery of the arms above water rather than under the chin. The glide is, of course, almost completely lost. The kick is shortened and more rapid; the breathing, timed with the recovery rather than the pull.

The butterfly is an experimental stroke, and the question whether it can be adapted to popular use cannot easily be answered. At present it seems too strenuous for the

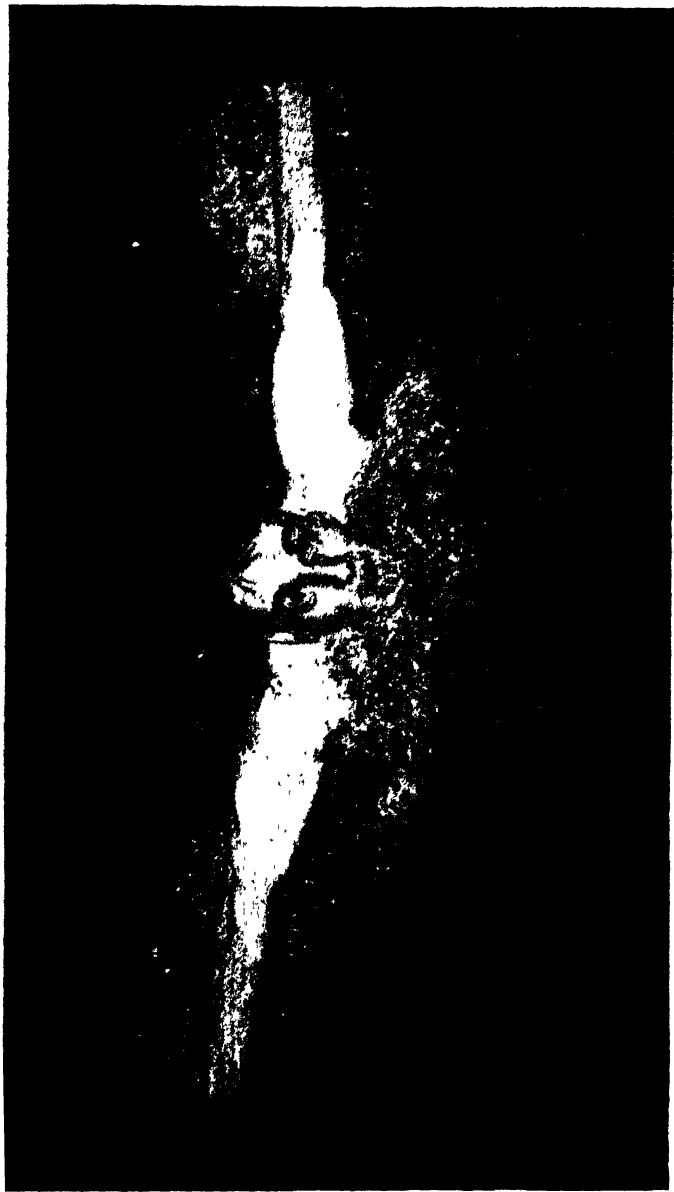


FIGURE 29. The butterfly stroke: a powerful overarm breast stroke.

The Complete Swimmer

average swimmer, although it shows evidences of gaining popularity. After all, man had the same difficulty with the crawl in its early days.

Many swimmers are able to pick up the butterfly stroke with ease, especially the free stylers who are used to an alternate overarm recovery. The arm pull contributes anywhere from half to three-quarters of the propulsive force and is executed in a variety of ways, as is the kick. It must be remembered, however, that the butterfly stroke is a form of the breast stroke and involves paired movements of the arms and legs and the maintenance of a level body position.

Probably the best advice for those interested in the butterfly is to "learn by swimming it." Its movements are too rapid to permit careful analysis, and do not lend themselves easily to practice by the tube or kicking board. The first step is to try the paired overarm recovery. From a glide position, the swimmer should raise his head until his eyes are just above the water, and pull his arms backward as in the regular breast-stroke pull. Instead of relaxing the arms and recovering them underneath the chin, he should continue the pull as far as the flexibility of the shoulders permits. The arms are recovered and thrown forward above water, to be submerged in an extended position in front of the head. The pull must be stronger than usual to make this type of recovery possible. A slow easy pull makes it difficult to extricate the hands and bring them forward before the body sags deeply. The real pull and recovery are all in one motion, the arms whipping strongly through the water and air to avoid a dead point in the stroke.

The pull itself may be shallow or deep; the swimmer

The Butterfly Stroke

will find by experimentation what is best suited to his size and strength. The recovery may be performed in several ways, with arms fully extended or bent free-style fashion. A wide-arm recovery with the arms slightly bent, the wrists hanging relaxed, and the shoulder and back doing most of the work seems to be preferred.

Those who already swim breast stroke will find that practice with the long pull while swimming under water will help them to learn the feel of the longer pull required in the butterfly.

The kick itself is simpler than that of the orthodox breast stroke. The recovery of the knees is almost completely eliminated. The knees are bent no more than enough to permit the legs to spread. In the kick the legs whip outward and together. The normal recovery and kick would be too long. Here the recovery must be short and relaxed, the legs "floating" into position, and then extended and squeezed in a powerful snap. The point of greatest pressure is at fullest extension as the squeeze begins.

There are two ways of timing this stroke. Those accustomed to the old breast stroke will be inclined to carry the same coordination over into the butterfly. With the stroke still beginning and ending in the glide, the legs will have to be recovered during the arm pull and will consequently throw a considerable strain upon the shoulder and arm muscles, reducing the effectiveness of the pull. Breathing occurs during the pull—exhalation, during the recovery. (Figure 31, A and B)

Because the arm pull is so valuable in the butterfly, efforts have been made to increase its efficiency by executing the kick at the same time. Although rather intricate, this

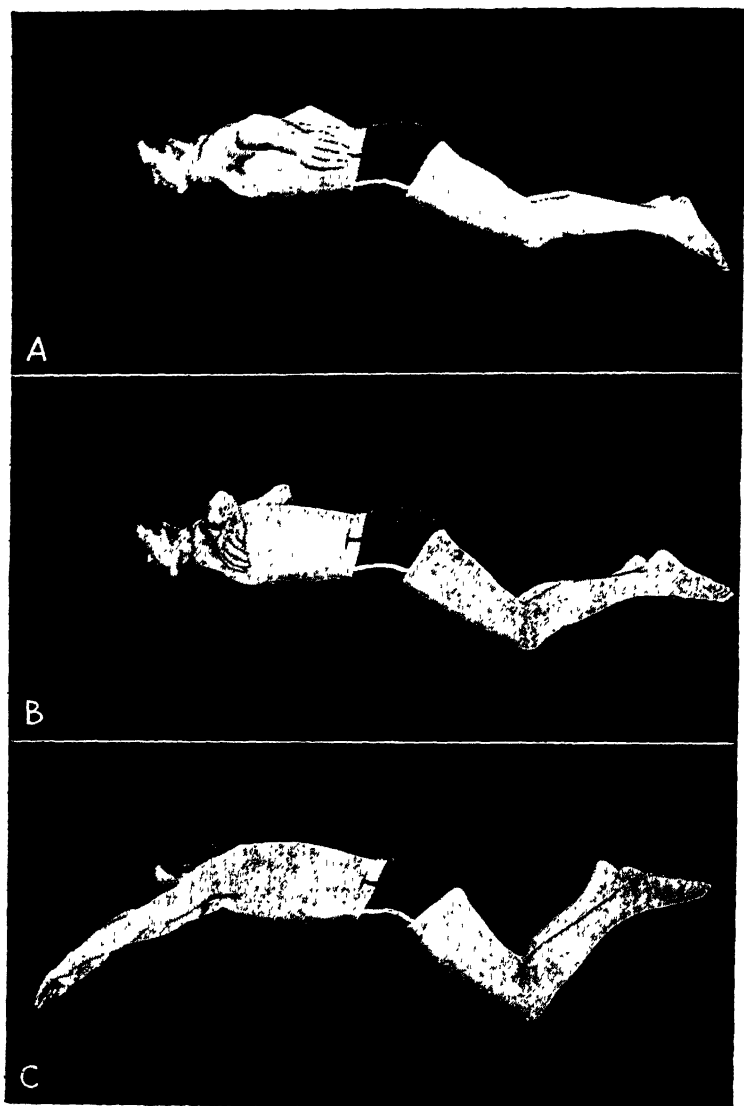


FIGURE 30. *A, B, C* (see *D, E, F* on opposite page), Coordination in the butterfly stroke. Note when legs recover and when kick is made.

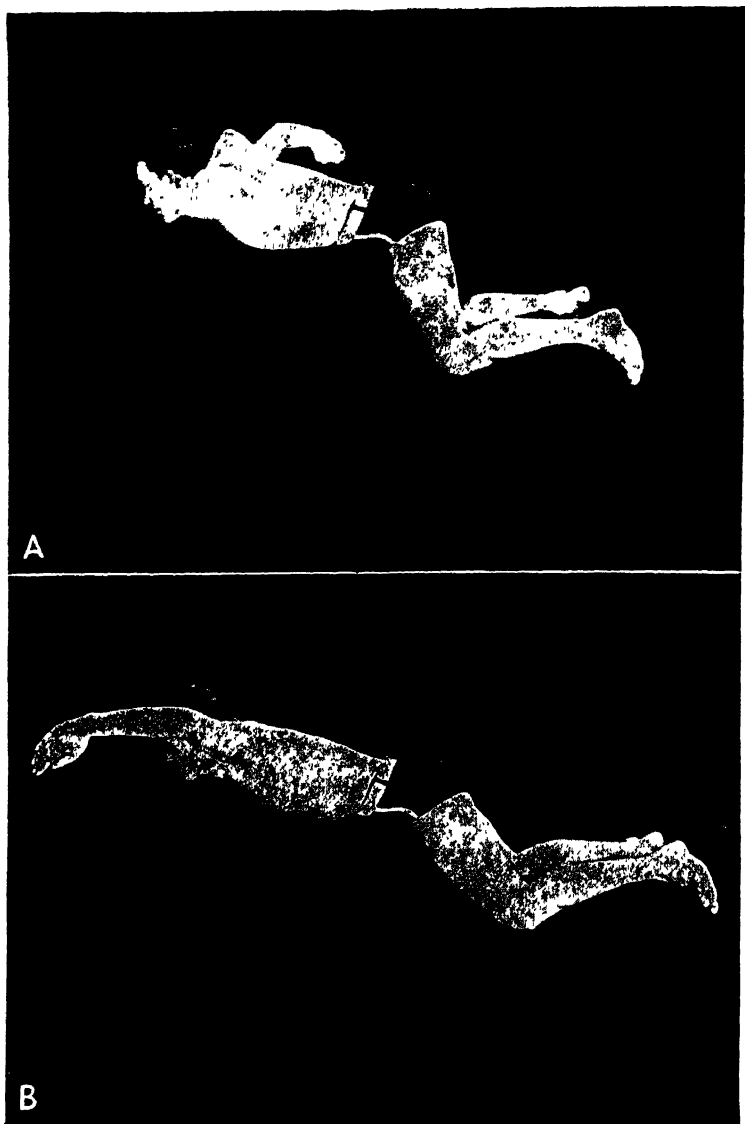


FIGURE 31. An alternate method. Arms are recovered during the kick.

The Butterfly Stroke

timing often is more effective than the other, making for an easier, smoother, and faster stroke.

The catch occurs before the legs reach full recovery. They are snapped backward at the time when the force of the arm pull is strongest. (Figure 30, A-F)

The effect is what anyone might expect. The body plows through the water in a great rush, arms at the sides, legs extended. This is the glide occurring at the conclusion of the arm pull and before extension. The swimmer does not inhale during the pull as in the orthodox breast stroke, but during the overarm recovery; he exhales at the end of the pull.

There is a possibility that the development of the double overarm will continue, for as yet it is by no means perfect. Such experiments as the dolphin stroke, originated a few years ago by a swimmer and a coach at a western university suggest possibilities still to be explored. In this case, an overarm recovery was combined with an undulation of the body somewhat similar to that of a fish. The stroke proved to be extremely fast, but was not accepted as a form of the breast stroke.

The swimmer approaching the breast stroke for the first time would do well to master the orthodox style with the emphasis on the glide. From here various modifications with the longer or faster pull can be essayed, and the full pull under water used. Then the swimmer can begin the overarm recovery, mixing it with his regular breast stroke. For the average swimmer the old breast stroke offers a fine grace and ease of movement; the butterfly presents an opportunity to invent some new wrinkle of his own and to speed up his stroke. He will probably want to learn both.

The Side Stroke

(THE SIDE STROKE is an old stroke, far slower than the crawl, back crawl, or even the breast stroke, yet still remarkably popular. Swum in a comfortable position on the side without straining the muscles or moving the limbs rapidly and with a luxuriously long glide, it is probably the least strenuous stroke of all. Its kick is the popular scissors and is easily learned by most persons because it is somewhat similar to walking. Although the coordination is in three movements, it is not complicated or difficult. Serviceable in a number of ways, this is the stroke for those who want to take their swimming easily, who care more for comfort in the water than they do for speed and power).

Extremely popular in England in the middle of the last century, it may easily have been derived from the breast stroke. Breast stroke swimmers may at some time have found the position of the head a bit wearying. To relax their neck a bit as well as to study their surroundings, they may have preferred to swim with their head turned to the side. Gradually, this would cause them to alter their stroke, sinking one shoulder and arm under the water and turning the body more on the side. This would break the paired-arm motion so that only the lower arm continued to reach forward in the glide while the other arm pulled more at the

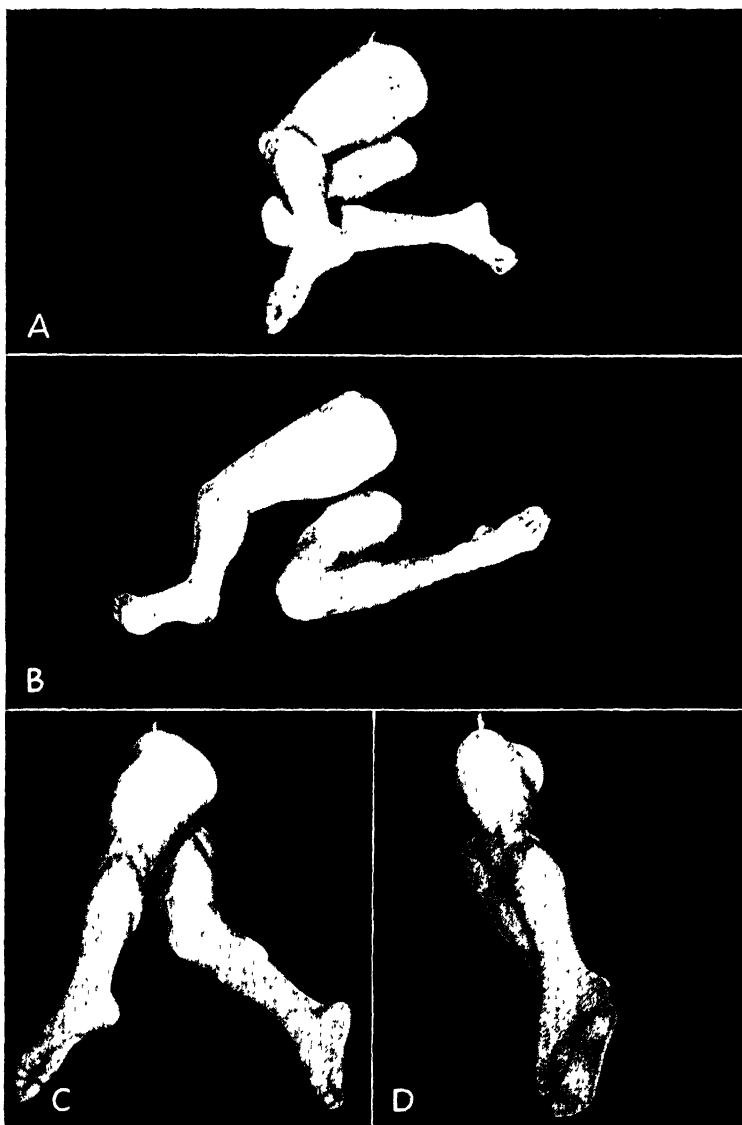


FIGURE 32. The scissor kick. Beginning of recovery to full extension.

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side. Finally, the extension of the under arm would accompany the pull of the other, both joining in front of the chest. Although it is wrong to use a scissors kick with the breast stroke, in the side stroke where the hips are twisted, the scissors would have to be used. Any breast stroker who turns gradually on his side while swimming will notice how naturally this change takes place.

The side stroke has been inherited by many of today's swimmers. Their fathers used it, and their grandfathers, and unless they fell into the hands of a swimming instructor, it was probably the only stroke in which they could get a rudimentary instruction. Although the side stroke is generally not taught to beginners or even advanced swimmers, it once was the stroke for everyone, competitor of everyday swimmer. The British took great pride in it during the nineteenth century, swimming it in their races with considerable speed. One of the outgrowths of it was the overarm side stroke, in which the upper arm—that on the side to which the head is turned—is recovered from the hips above water to a position slightly in front of the head.

Comfortable as this stroke is, the beginning swimmer will find it difficult to maintain proper balance on the side until he has achieved coordination and an effective kick and pull. (Those, however, who have found the overarm action of the crawl too tiresome, and who lack the strength for a strong breast stroke, may find the side stroke well adapted to their necessities. Further, persons who cannot achieve the relaxation needed in the crawl may find that the motions of the side stroke come more naturally.

It is in lifesaving, however, that it has its most important use. Excellent leverage is obtained from the lower arm and

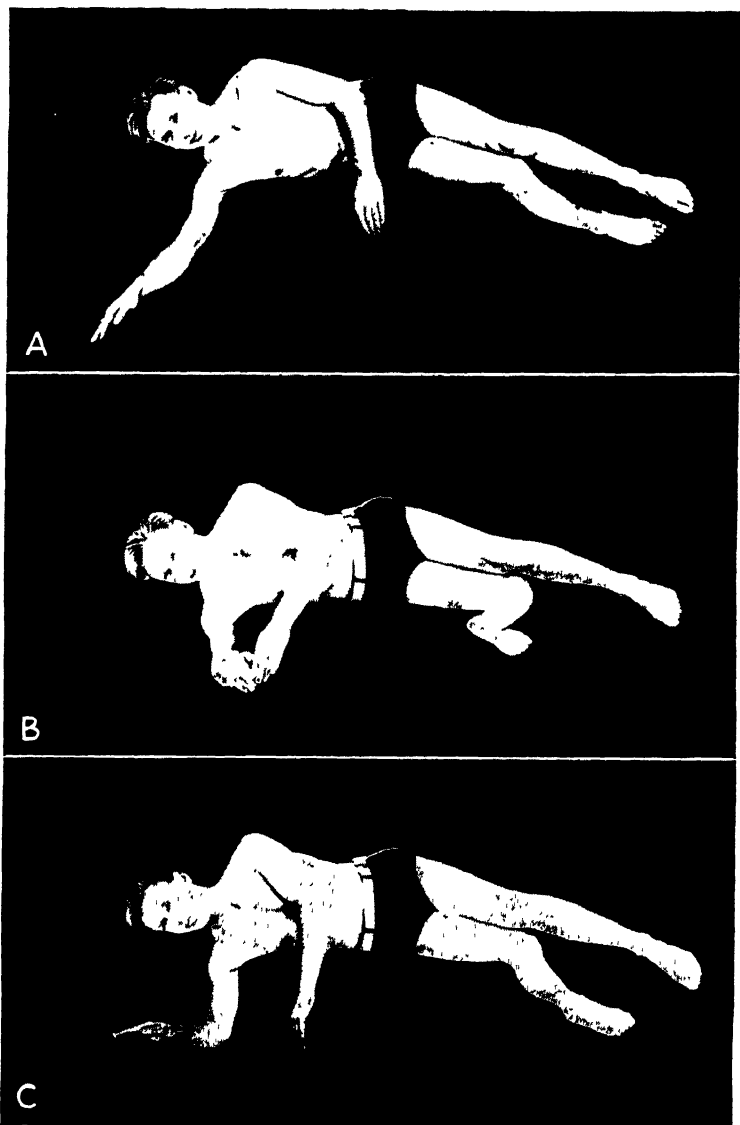


FIGURE 33. *A, B, C* (see *D, E* on page 122), The side stroke, beginning with pull of right arm, recovery of left.

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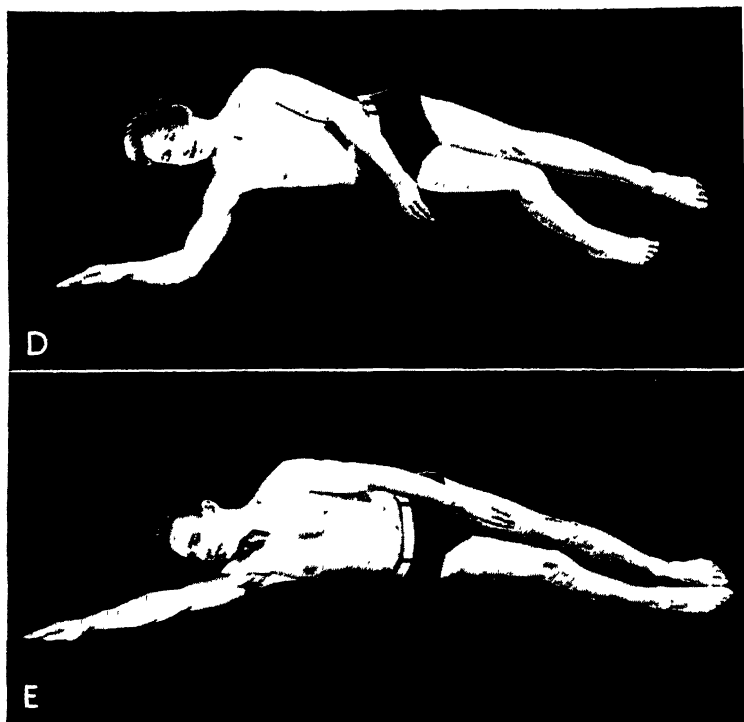


FIGURE 33 (concluded).

the legs, and the upper arm is free for holding the subject in the cross-chest and hair carries. Because of its scissors kick alone, the side stroke is worth learning, for the scissors is useful not only in the two carries mentioned but in the head carry should the rescuer lack a good breast-stroke kick.

In learning the side stroke, the swimmer will probably want to push off in the usual glide position several times, and while coasting through the water turn onto his side.

The Side Stroke

This may be accomplished by pulling one arm backward and sideways and turning a shoulder downward. The position can be held only when there is momentum; once it is assumed, the stroking should begin.

Arm Stroke (Figure 33, A-E)

The arm stroke starts with one arm extended out front, the cheek resting on the shoulder, and the other extended back toward the thigh. The pull of the forward arm is simultaneous with the under-water recovery of the rear arm and the recovery of the legs. Both arms meet in front of the chest. The kick is then combined with an extension of the lower arm and a pull of that in the upper position, one arm forward, the other backward.

Suppose, for example, the swimmer is lying on his left side, his left arm extended, his right arm back by his thigh. The stroke is as follows: Pull the left arm to a position directly beneath the shoulder, or slightly outside. Relax it near end of the pull, drawing it toward the front of the chest; at the same time recover the right arm under water to the identical position. Then release both together, one extending, the other pulling. It is one continuous movement until the end of the glide.

The Kick (Figure 32, A-D)

Various side-stroke kicks have been in use at one time or another. A fast kick was achieved by swirling the legs back and forth in what almost amounted to a double scissors or broad flutter kick on the side. A slower kick resulted from a straight thrusting movement similar to that of a frog.

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The most efficient kick, however, is the scissors, which combines a thrusting and a squeezing of the legs in a whipping motion that shoots the body swiftly ahead.

To learn the scissors, the swimmer can hold onto the side of a pool or float in upright position and, if the water is clear, go through the movements watching them carefully. From a position in which both legs are extended and together, the knees are drawn slowly upward, the legs separating about six inches, one knee moving slightly ahead of the other. Full recovery position would show the swimmer with both legs cocked, the upper ready to drive the surface of the foot backward against the water, the lower prepared to whip the ankle back and inward. The legs are driven simultaneously backward and together in a strong propulsive movement.

As in the breast-stroke kick, it is the combination of a thrust and a squeeze that makes this effective. A straight backward push would yield little power; a spread and squeeze might yield a little more, but it would not be as strong as the true scissors motion with emphasis upon a snapping or whipping movement.

To prevent the recovery in the scissors from being too much of a check, coordinate it with the pull of the lower arm. Meanwhile, pull the upper arm simultaneously with the kick to intensify the drive and to stabilize the body position. The swimmer should try to coordinate the arms and legs from the glide position, by pushing off, swinging onto the side, and pulling one arm back to the hip and the other downward, and simultaneously drawing the knees upward. The longer the swimmer can wait before recovering the legs, the better, for in the recovery position they are a real hindrance. Recovery is at the end of the arm

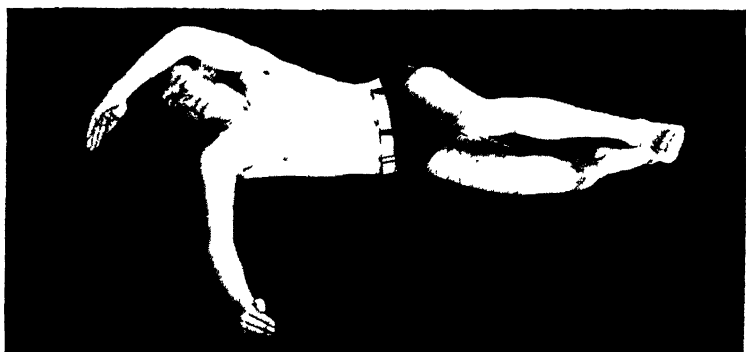


FIGURE 34. The overarm side stroke.

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pull, while the arm still grips the water as it begins to relax for its own recovery. The kick, the extension of the lower arm, and the pull of the upper arm are simultaneous. The swimmer inhales with the pull; exhales during the glide.

The overarm side stroke calls for no fundamental changes. The upper arm simply recovers through the air rather than under water. The recovery can be longer, extending in front of the head rather than in front of the chest as in the under-water side stroke. The under arm works in about the same position, and the kick occurs at the same time. Recovery of the upper arm above water increases the speed of the stroke. (Figure 34)

The Trudgen and Other Overarm Strokes

THE CRAWL IS NOT the only method of swimming overarm. Some of its historic predecessors are still used and liked to-day although they may in general be poorer strokes. The fundamental difference between most of these strokes and the crawl is the kick. The modern undulating flutter seems to be a relatively new phenomenon; previously swimmers contented themselves with various forms of a breast stroke or scissors kick coordinated with the alternating overarm.

The general name given to these other forms of overarm swimming is the trudgen. It once specifically referred to a stroke introduced into Europe by one John Trudgen. Popular usage soon made "trudgen" a word to describe any of the new forms of overarm swimming; but with the development of the crawl and the free style the word is used less and less. Today's children are taught the newer and faster strokes, and consequently pay less attention to the trudgen their fathers swam.

Although it is an overarm stroke, it is not to be classed with the crawl stroke but rather belongs with the side and breast strokes. This is obvious to any person who has watched it swum or who uses it himself. Like these other strokes, it lacks the flowing, liquid movements of the crawl. In it, the arms and legs move more slowly because

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the whole process has to be regulated by the kick—as the swimmer has already learned, the legs cannot be coordinated at a high pace in the scissors or breast-stroke kicks because of the hampering effect of the leg recovery.

Like the side stroke, then, the trudgen becomes a handy stroke for those who cannot achieve the efficient flutter kick of the crawl. It is a comfortable stroke, in which the strain of the overarm action is mitigated by the slow action and the powerful single kick. It makes possible the scissors kick, which for many is more natural and easy to perform than any other. For long swims in which a strong but not too fatiguing stroke is needed the trudgen will often serve.

Historically, the stroke is important. Although the overarm stroke seems to have been as old as swimming itself, having been used by the Hittites, the Romans, and the Indians with a variety of kicks, it was not popular with the white races until the nineteenth century. When John Trudgen first raced with it in England, the swimmers of that nation were ripe for newer and faster strokes. A half-century earlier, the trudgen might have received no attention; but about 1863, when he learned the stroke that bears his name, the sport was beginning to enjoy a new popularity. When Trudgen first lunged into his fast overarm, the swimming enthusiasts gaped; but so impressive was his demonstration of speed that they immediately began to try it. As a matter of fact, some may already have been using a similar version of the overarm even before he demonstrated it in racing, for it had been widely popular with the South American natives, who perhaps swam it considerably better than he did. Furthermore, the transition from the side stroke to the trudgen was as natural as the shift from the breast stroke to the side stroke.

The Trudgen and Other Overarm Strokes

The British were then racing with the overarm side stroke, and some must surely have experimented with the recovery of the under arm by rolling the body forward onto the chest. This probably was the way the new stroke was adapted to British usage after Trudgen had shown its value. Trudgen seems to have swum with his body on a continuously horizontal plane, his head high and facing forward. His recovery was short, the arms entering the water at the shoulders, and he seems to have lunged forward with each pull—in other words, to have used some strongly propulsive kick with each stroke. The assumption would be that his kick was the scissors, were it not for the body position which would have made it difficult to twist the hips for this kick. The more popular assumption is that he used a form of the frog or breast stroke.

Trudgen's stroke was not a natural development of the side stroke, but the British made it one. Already accustomed to using a scissors kick, they probably incorporated it with Trudgen's overarm. The use of the scissors called for a variation in the body position, however.

A person swimming an overarm side stroke can change easily to the trudgen by simply pulling the under arm back until it can be recovered above the water. If the side stroker is on his left side, for example, his left arm normally executes a deep pull from the extended position out front to a point below the shoulder and then recovers to the forward position under water. This time, however, the swimmer rolls forward onto his chest, pulls the lower arm farther back and recovers it above water. As in the side stroke, the kick coincides with the recovery of this arm and the pull of the other.

Although the swimmer should try to reproduce the

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crawl arm stroke as closely as possible, beginning it only after the arms have sunk to a position twelve or more inches under water, the pull in the trudgen is longer. The scissors kick should be practiced assiduously, for without a strong thrust the trudgen is valueless.

The coordination is not too difficult (Figure 35, A-I). Having first determined upon which side he wishes to breathe, the swimmer can push off in the glide position.

The legs are recovered with the first arm pull. The kick throws the corresponding arm forward, and is simultaneous with the pull of the other arm. The swimmer inhales with the recovery, exhales with the kick.

The stroke tends to be distinctly one-sided, and is still primarily a side stroke; yet if the swimmer will take the time to regulate his strokes carefully so that they are equally spaced, with each pull as full and as long as the other, it will lose the jerky quality that often characterizes it. The swimmer will feel the impulse to lie out in the glide in a long coast, yet it is far better to cut the glide short so that stroking becomes a continuous process.

The Double Trudgen

The trudgen was a fast stroke but tiring for racing, and many swimmers still clung to the old side stroke in the longer distances. Others in their search for increased speed gradually modified the kick, increased the length of the arm pull, and made its action faster. It was, however, the discovery about the turn of the century of the Australian crawl with the flutter kick that marked the beginning of a long series of changes in the old trudgen.

What has made the trudgen a difficult stroke for fast

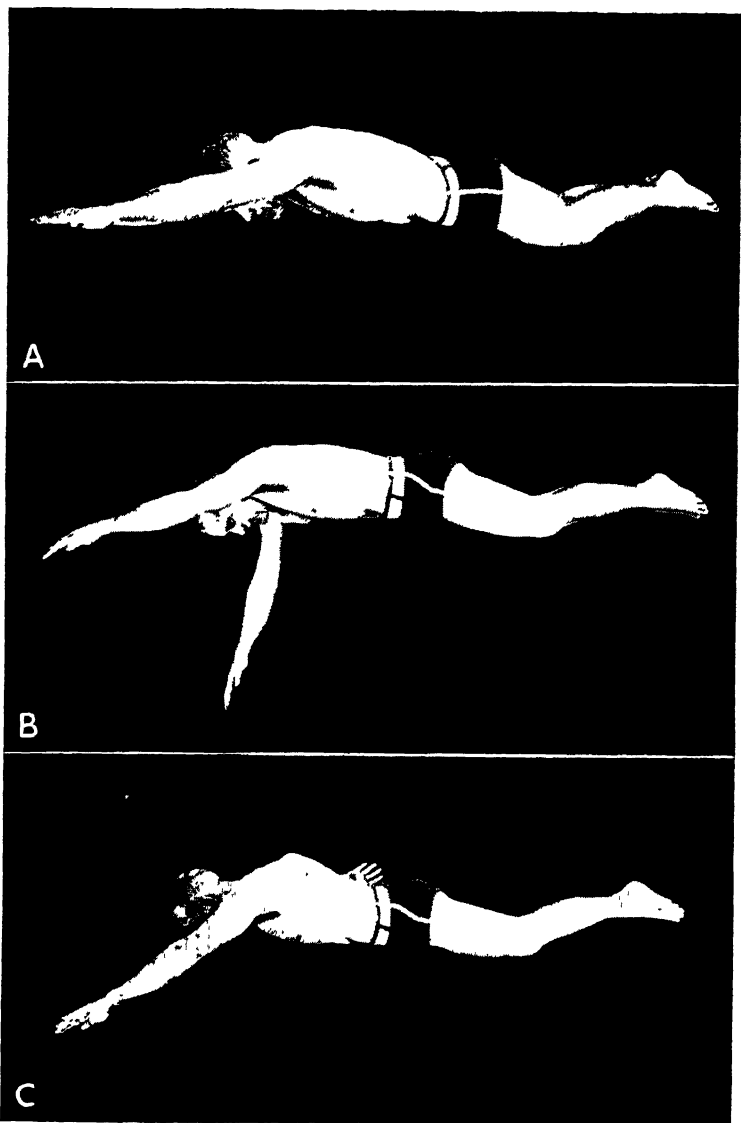


FIGURE 35. *A, B, C* (see *D, E, F, G, H, I*, pages 132 and 133), The trudgen stroke, starting from glide position.

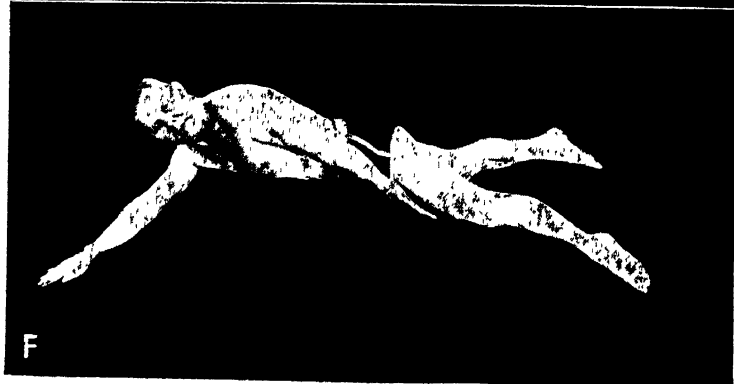
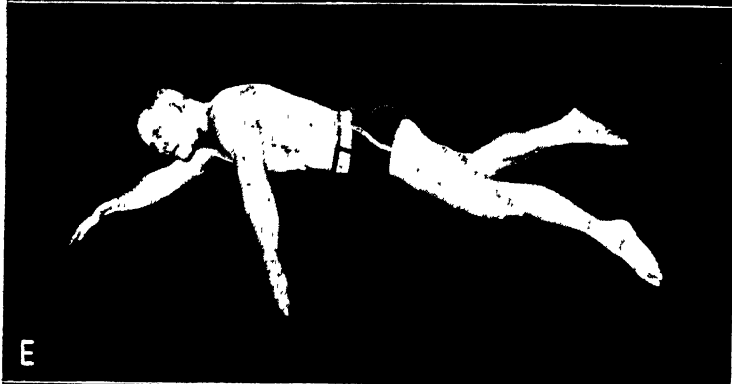
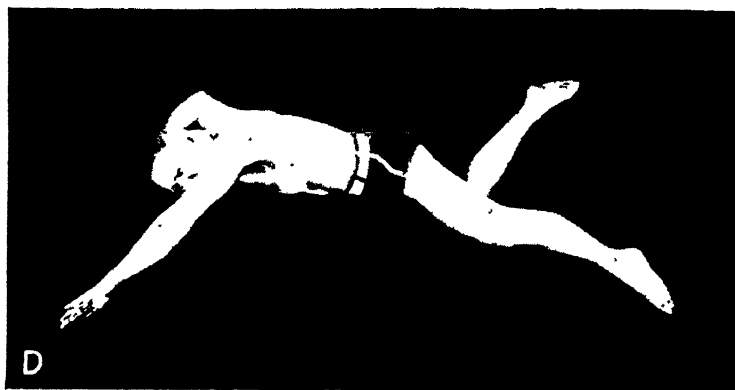


FIGURE 35 (continued).

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swimmers is the undue strain placed upon the arms by the retarding recovery of the legs. It was Dick Cavill who was smart enough to then realize that in a race a scissors kick might be more of an encumbrance than a help. The lesson was brought home to him graphically when he saw his brother Tums with his legs tied beat another swimmer only to lose to that same swimmer when his legs were untied. Dick undertook the task of finding a kick that would not be such a drag on the overarm stroke, and finally adopted a straight-legged kick said to have been a favorite with the natives of Ceylon. Like Trudgen, his performance in races convinced swimmers everywhere that here was a kick that was a natural adjunct of the overarm motion. From then on the new crawl entered upon a gradual development culminating in the fast modern free style.

The old trudgen was not dropped immediately, however. The crawl kick was considered too exhausting, and many tried instead to remodel the trudgen, eliminating some of its retarding action. One result was the perfection of the double trudgen, which combines a broad scissoring motion with two smaller flutters. The full scissors had been already broken down into a smaller slashing motion of the legs, and it was still further modified in the double trudgen.

Here one broad slash is followed by two smaller beats and then another broad slash. The slash is executed with the extension of the arm, the two beats occurring during the pull. It is a form of kick to which free-style swimmers sometimes shift in swimming the greater distances. As the legs tire in the flutter kick, they tend to spread and to seek a broader, relaxed action which resembles the scissors kick.

The Trudgen and Other Overarm Strokes

The Trudgen-Crawl

One combination of the trudgen and the crawl which still has considerable popularity is the trudgen-crawl, combining a scissoring motion on one stroke with a three-beat flutter kick on the other. The stroke is precisely that of the trudgen, except that the legs, instead of being left idle on every alternate stroke, are fluttered.

Most persons will find it easy to pass from the single trudgen to this stroke. If they first practice the scissors kick alternating with a three-beat flutter kick on the shore, by stretching over a bench or box, they will soon be able to make one set of motions flow into the other. In the water the coordination of the trudgen-crawl is the same as that of the single trudgen. The scissors kick propels the body as one arm swings forward, the three-beat kick is used with the other arm's recovery.

Thus, it can be seen that there is a gradual evolution from the breast stroke to the side stroke, from the side stroke to the overarm side stroke, and from this form to the trudgen, double trudgen, trudgen-crawl, and crawl.

This would seem to indicate that the swimmer could develop his strokes in the same way, gradually improving from the slower and older to the newer and faster strokes. If this easy development were possible, the trudgen would have been described before the crawl and as a natural step in learning the crawl.

However, the muscles when accustomed to one stroke pattern do not change readily to another, and those who first learn the trudgen will find that, to go on to the crawl,

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they must begin all over again. They will find it difficult to eliminate the strong scissors kick and the roll to the side on the glide. They will find it easier to learn the crawl as a separate stroke, first trying the kick, then practicing breathing and the arm pull without the sharp roll to the side.

The flutter kick is really a series of modified scissors yet the muscular action is entirely different. Although swimmers sometimes tend to slip from a flutter to a scissoring motion when tired, few change from the scissors to the flutter kick. The latter brings different muscles into use, and requires a different type of flexibility and relaxation. It is a faster, looser motion, but is less natural because the muscular action does not correspond to that used in running, walking, or jumping on land.

Thus, the beginner will want to learn to swim by means of the elementary crawl and from that graduate to the free style and to the back crawl, both natural steps. The breast stroke may be attempted, and the swimmer may increase his all-around ability by learning the scissors kick. Those who find the flutter too taxing may prefer to turn to the trudgen, which is not a slow stroke for average use, or if they do not wish to work their arms above water, may try the graceful breast stroke or the side stroke, about as comfortable a method as they could want.

Turning in Pools

A LARGE AMOUNT of swimming is now done both indoors and outdoors in pools. These are generally enclosed bodies of water, rectangular, from twenty to fifty yards long, and of varying depths. Swimming in them would tend to be limited to the length of the pool were it not that an easy method of turning at the ends has been developed. Turning is simply the art of touching the end, spinning about and pushing off to begin swimming the other way, and can be executed as a natural part of the stroke. Instead of retarding a swimmer, it increases his speed, for experience has shown that competitors are faster in pools than on straight courses. It affords the swimmer a brief rest, a chance to get a lungful of air, and a means of catapulting himself on his way again in a long under-water glide.

Crawl Stroke Turns (Figures 36 and 37)

The crawl stroke, backstroke, and breast stroke have separate styles of turning. In the crawl stroke two types can be learned, the top-water or open turn in which the swimmer takes a breath as he wheels about, and the closed or under-water turn in which no breath is taken. The aver-

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age swimmer will prefer the former; the competitor the latter.

The fundamentals of both are about the same. One hand or the other extending forward in the recovery touches the pool end; while the pulling arm drives the body closer, the legs are tucked up toward the stomach and the whole body pivots about. It moves in the opposite direction from the arm that touches.

The swimmer then drops under water and the feet are planted against the end, the legs still bent. From this position the body can be hurled forward in a long glide, arms outstretched, legs extended. To prevent the trunk and legs from drifting away from the end of the pool, the pulling arm is used as a lever, first in a backward sideward movement to help the body around, next in a scooping motion the palm faced outward and away from the turn.

In the open turn the head is lifted for a quick breath as the hand touches and then is submerged during the spin. In the closed turn the head is ducked under at the outset, and no breath can be taken until the stroke begins at the end of the glide or push-off.

The turns can be practiced in shallow water by simulating the swimming position and going through the movements slowly as illustrated in Figures 36, 37. It is well to learn to approach with either arm and to turn to either side. The beginner can next try swimming into the turns slowly, making certain that the body is in the correct position before pushing off. Feet should be firmly against the side and not too low, knees drawn up under the hips. The back should be about a foot under the water and parallel to the surface.

Turning in open water is a valuable exercise in addition



FIGURE 36. Walking into an "open" crawl stroke turn.

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to being a maneuver that the swimmer ought to learn anyhow. The same type of turn is executed, except of course that there is nothing solid to touch or to push the legs against.

The Backstroke Turn (Figure 38)

At first most backstrokers have difficulty gauging their arrival at the end of the pool, but after a while familiarity with distance and the pace of their stroke, along with an ability to look out of the corner of the eye at the side of the pool, will solve this problem. The backstroker, like the free-styler, tries to touch when the arm is in an out-stretched position and immediately wheels in the opposite direction. The body is flipped about by the hand that touches, and the movement is aided by the pulling arm. The hips sink, the legs are drawn up toward the stomach, then as the body submerges are placed against the side for the push-off. The body is, of course, still in an inverted position.

To get a fast spin, the pulling arm can be scooped strongly toward the hips in a sideways movement. Then, this arm moves forward to a position parallel to the other near the head so that with the push-off both arms can be extended forward.

While in the push-off position the feet are about fifteen inches below the surface, the knees bent. The push is directly backward under water, the head low and on an even keel with the spine.

In this turn the swimmer can inhale, if necessary, during the spin and should then exhale during the glide.

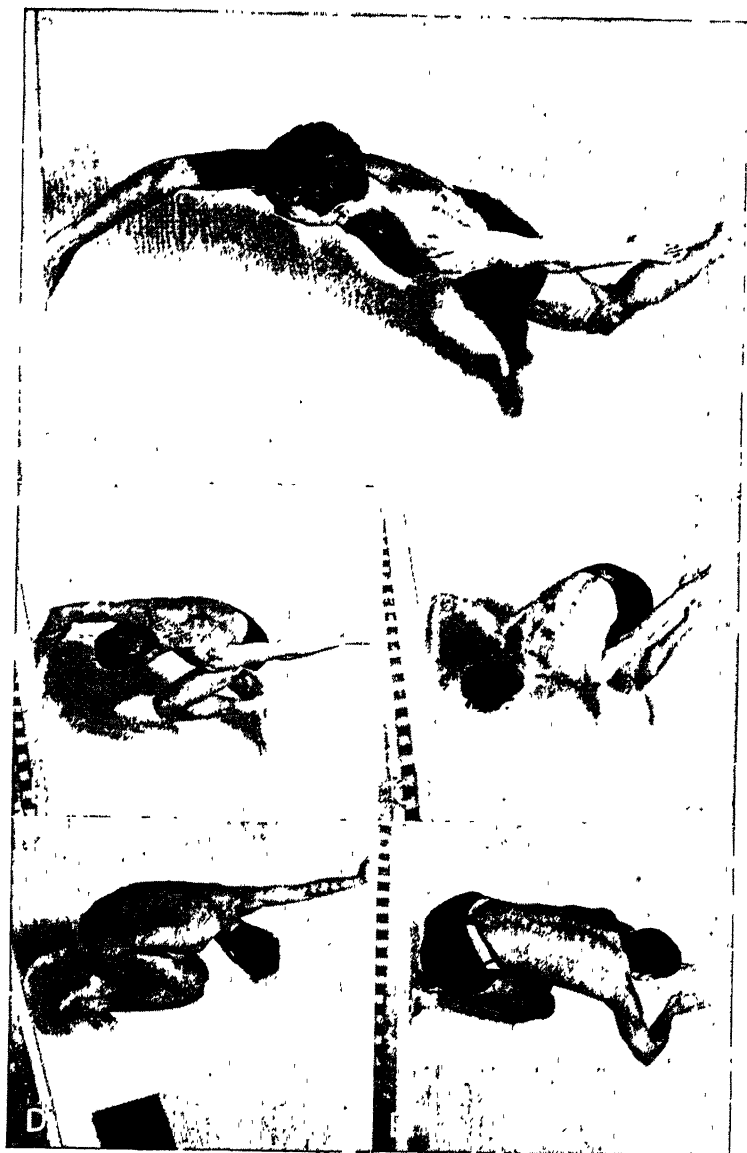


FIGURE 37. Practicing the crawl stroke "closed" turn.

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The Back Tumble Turn

A more acrobatic and possibly a faster means of turning can be found in the tumble or back somersault turn. It is exactly what the name implies. The hand that touches is dropped deep down into the water, the head follows and then the rest of the body which has meanwhile curled into a ball. When almost completely over the body is given a half-twist which puts it into the original position on the back.

The feet flip over the shoulder of the arm that touches the wall and are then dropped against the wall of the pool for the push-off.

This turn is really a quick flip with the hips, thighs, and lower legs rolling into a ball toward the head as it sinks. It prevents the swimmer from getting a breath and may cause the water to flow up the nostrils of some, but it compensates for these disadvantages by its speed. To many it may seem more natural than the orthodox backstroke turn.

The Breast-Stroke Turn

This is the easiest of all turns and is really nothing more than a quick flip which reverses the position of the body. The approach is easy because the swimmer can time his stroke so as to bring his arms to full extension when they touch the end of the pool. Without bending the arms, he uses the force of his glide and a thrust of the fingers to fling the shoulders about. Meanwhile the legs are tucked in beneath the trunk. When the body reaches a forward position, it submerges about a foot below the surface; the feet are braced firmly against the side, and the hands are



FIGURE 38. The backstroke turn.

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held in readiness below the chin for the glide. In this turn as in the others, it may be necessary to scoop outward with the hands to brace the body against the wall before the push-off.

The swimmer takes a breath as the hands touch, holds it throughout the turn, and exhales during the glide. In spinning about, the shoulders and upper body may be lifted slightly through the pressure of the hands against the side of the pool. This will make it easier for the swimmer to submerge quickly to the necessary depth for the under-water push-off.

All of the turns are similar in a number of particulars. In each an effort is made to touch with the arm fully extended, although this is not necessary. In fact, a popular variation in the free-style turn is made with a bent arm touching the pool above water (Figure 36). In the crawl and backstrokes only a single arm touches although in the breast stroke both arms do so simultaneously. There is a variation in the backstroke, in which the pulling arm is also used to grasp the side of the pool; but this is not common because it can be executed only in pools with gutters or sides low enough to grab.

The push-off position is also the same in all three turns, with the exception that the backstroke position is the reverse of the others. The feet are planted firmly against the wall, the knees fully bent, the body parallel to the surface and about a foot or more under water. The legs are of course somewhat deeper than the body.

The push-off is an important part of turning, for here a swimmer can make up for lost time by projecting him-

Turning in Pools

self into the water like a torpedo. Here also he can rest for a few seconds while the body shoots swiftly forward. In all three turns the swimmer tries to push off into a glide about two feet or more below the surface, straightening the body into a nonresistant straight line.

After the glide position, the movements differ for each stroke. The crawl stroker begins his kick and takes a single arm pull to bring himself to the surface. The backstroker does the same although he may be unable to glide as far out under water. It is the breast stroker, however, who can really make the most of this stage of the turn, for his stroke is as useful under water as it is above. He can glide farther and deeper than the others and take a single arm pull, then use the thrust of his kick to bring him to the surface. Or, if his wind is good, he can take a long arm pull back to his hips, kick, and then use the next arm pull and kick to bring him to the surface. In all three push-offs the swimmer can coast under water for two or three yards and sometimes much farther.

Steps in Improvement

IN SWIMMING, as in other sports, it is one thing to know what to do and another thing to apply this knowledge. The swimmer now has at his disposal a complete breakdown of all the fundamental movements; yet, no matter how well he has them in mind, he will find it difficult at first to execute them in the water. Although as a beginner he may have lost his original awkwardness in the water, nevertheless with every attempt to learn a new stroke some of this awkwardness will return and can only be vanquished over a period of time. Furthermore, he will find that whenever one movement is performed properly, other movements are incorrect, and when he shifts his attention to those still further mistakes bob up. In other words, becoming a complete swimmer is a gradual rather than an instantaneous process; yet this need not be discouraging, for it is the feeling of a growing mastery over the water, achieved from day to day, that is one of the chief thrills of the sport.

Imitating Others

The swimmer can generally help to advance himself by watching more accomplished performers. In this sport,

Steps in Improvement

perhaps more than in most others, emulation is valuable, for swimming motions are slow enough to permit careful study and analysis by onlookers. Despite the welter of foam, the method of recovering the arms, sinking them out front, and of breathing is obvious, as is furthermore the general body position and the action of the legs. Even more important, by watching others a swimmer can get a mental picture of the general grace of the stroke as well as a sense of its rhythm, and upon swimming afterward will be able to get more of these qualities into his own stroke. Let a young novice watch a champion drop his arms with a loose "plop" into the water, and the next time he swims the novice will be dropping his arms with the same "plopping" sound. His movement will not be precisely correct, yet by imitation and practice he will eventually be able to approach the champion's stroke.

This raises the point of whether a swimmer wants to duplicate the strokes of better watermen. With beginners this is essential because they are learning fundamentals and often respond to actual demonstration by an instructor. To a person whose stroke is beyond the formative stage, however, emulation carried to extremes can be definitely harmful, for everyone is an individual in the water and no two persons swim exactly alike. Size, relative body proportions, strength, energy—all these factors modify an individual's stroke. Even his temperament will affect it. The strokes of good swimmers should be studied, then, as suggestions for possible changes rather than as perfect strokes to be imitated in every detail.

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Making a Stroke Fit

Just as every swimmer will have his favorite stroke, so he will also develop a favorite way of executing any stroke. The problem confronting every swimmer is to find the medium best suited to his particular specifications. He must tailor his stroke to fit. This does not permit him to indulge in what are generally considered to be faults. To pull the arms to the side rather than beneath the body in the free style is a fault, no matter who does it. On the other hand, there can be marked differences between swimmers over such points as the height at which the head is held, the length of the arm stroke, or the general speed of the stroke as a whole.

Both Johnny Weismuller and his coach and trainer Bachrach were smart enough to adapt the crawl to Johnny's rangy torso, inculcating in it such movements as seemed beneficial, disregarding others. The Japanese actually invited American swimmers to their country so that their strokes could be studied, and then went on to adapt the American methods to their special build. This is the way the average swimmer should test new ideas. First, the new movement should be carefully tried, then fitted to his stroke in the way that feels most natural.

Experimentation

One other lesson can be learned from the Japanese and from Johnny Weismuller as well as from numerous other great swimmers, and that is the value and fun of experimentation. Swimming progress has depended in the main upon trial-and-error tests made by swimmers who were

Steps in Improvement

enterprising enough to try something new despite its difficulty. Recently the butterfly stroke came into being in this way, and for a time the early experimenters were far ahead of the orthodox breast strokers. The swimmer can not only perfect his strokes by experimentation but also, if he feels so inclined, modify them into new strokes. The crawl is a modification or an amplification, as one looks at it, of the side stroke. The flutter is a successful modification of the scissors kick. A whole unknown world of swimming stretches ahead into which anyone can venture to find new and better methods.

Working for Perfection

Like a golfer, like any athlete, the swimmer is never satisfied. He is watching his strokes most of the time, asking himself such questions as: "What are my legs doing? Is my body twisting? What is happening to my arms on the recovery, that they splash so much water?" Lifting his head high out of the water for a few strokes, he can look around quickly at his kick to see if his legs are too deep or are breaking water too much. He can discover in this way whether his hips are twisting and whether the body is rolling. By holding his head backward longer than is necessary as he breathes, he can watch his arm recover and observe whether it is dragging along the surface. By turning his head to the other side, he can study the other arm. By holding his breath for a few strokes, he can watch his arms enter the water, note where they catch, and observe their pull until they flash out of sight below the shoulders. In many pools mirrors have now been placed to enable a swimmer to study his movements still more thoroughly.

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In perfecting their strokes, swimmers have the advantage of being able to move slowly until they become almost mechanically correct. Distance swimming is the best means of improvement for all watermen from beginners to experienced competitors. This does not mean a mile or two miles or half a mile; it means whatever distance an individual can swim without too great effort at a slow, even pace. The importance of distance swimming is that it makes for measured, rhythmic movements and teaches relaxation. The emphasis at first should always be on form rather than speed. So that they may concentrate exclusively on form, some persons practice entirely by time, for one minute, five minutes, fifteen, as long as they feel able to continue.

These swims provide an opportunity for developing coordination and then, in the crawl, for learning the isolation of the working parts. In the breast stroke, the side stroke, or the trudgen, they enable a swimmer to work toward the elimination of the strong negative recovery of the legs. This is the time when the swimmer can study his stroke carefully, experimenting, testing, and changing. Here an opportunity is presented to train the muscles in the fundamental movements so that in an emergency, when the swimmer has little time to think of form, they will respond as obediently as does the motor of an automobile.

Distance swimming rather than sprinting will always give a follower of the sport his chief pleasure. This is the way in which he can thoroughly exercise his body without straining it, meanwhile enjoying the smooth-working efficiency of his stroke. This is what stretches and strengthens the muscles.

Steps in Improvement

Sprinting

Yet everyone likes to move rapidly through the water, for it has its own special sensations. Once a swimmer is sure of his mastery of the fundamentals, he can begin trying short spurts at full speed. These constitute an excellent means of testing how well his stroke has been learned. If the first sprint finds the arms flying wildly and pulling badly, the whole stroke a thrashing medley of inefficiency, then his distance swimming has not been sufficiently conscientious. The aim in fast swimming is to preserve the co-ordination and form of the stroke while increasing the power. The legs and arms should continue to keep the same leverage, no matter how hard the pull or the kick. The body should ride along in the same position, the breathing as regular as when swimming slowly.

Later the sprints can be combined with distance swimming. The swimmer can start slowly and, as he warms to his stroke, increase its tempo until he moves at about three-quarters of his speed for ten or fifteen strokes, and then slip back into the slower rhythm. Attempting these spurts will teach him to change speed without seriously impairing form. When he is about to finish, he can ride home at full speed.

Aids to Practice

The use of boards and tubes in practice has already been mentioned in connection with the strokes. These make swimming tedious, yet for those who want to strengthen and perfect their stroking, no better way could be found. They are even preferable to practice on land, for they not

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only enable the swimmer to concentrate on particular movements but teach his muscles the "feel" of the water. None of these aids is of any use in the development of timing and coordination, but they are of special value to a swimmer who may have, for example, a weak stroke in the crawl or a poor flutter kick.

There are of course alternative methods of using the arms and legs separately. A swimmer can hold onto the side of the pool or lie in shallow water, hands on bottom, and, extending his legs backward, practice the kick. He may hook his legs through a ladder or over some projection and swim only with his arms. Use of these artificial aids can be made part of a regular workout in which the swimmer first goes into his distance, then kicks the board a hundred yards or more, tows the tube a similar distance, and finally takes a short swim ending in a brief sprint.

The greatest hindrance to improvement is muscular tenseness, which may result from the condition of the muscles themselves or may be due to the swimmer's attitude toward the water. It has already been pointed out that the beginner who has most difficulty in the water is one who is muscle-bound or unable to move the arms and legs freely. Not only do such persons float poorly, but they tend to thrash the water, lacking the suppleness to gain a leverage on it. There are others who may not be muscle-bound but are so accustomed to heavy muscular work that they cannot easily achieve the relaxation necessary for good swimming. Others may simply tense their muscles because of some physiological maladjustment to the water.

For all of these groups, exercises that stretch the muscles will be beneficial. A whole series can be drawn up in which the arms and legs are moved in an extended position, thus

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straining the muscles of the shoulders and of the thighs and hips. Lying on the stomach, one can stretch the arms to the side or out front, lift them from the ground as high as possible, and then gradually swing them back and forth. They can be clasped behind the back, and the shoulders stretched backward. The muscles at the back of the legs can be stretched by such exercises as bending from the waist to touch the toes, sitting down with the legs outstretched in front and again reaching out to the toes, or lying on the stomach, lifting the legs about a foot off the ground and kicking them flutter-fashion.

Mental Attitude

Mental attitude has a marked effect on a person's ability as a swimmer. The mind sends out the little messages that tell the legs and arms what to do, and controls the nerves and muscles. When the beginner first enters the water, his muscles contract, he shivers briefly, and for a time his movements are jerky and unnatural. Gradually, as he moves through the various beginner's exercises, he becomes used to the water, his muscles relaxing and moving as normally as they would on land. Not only does his body become more accustomed to this new element, but his mental attitude toward it changes. And as he continues to improve he feels more at home in the water until eventually swimming is almost second nature.

Thus mental and physical relaxation goes hand in hand, and often the physical tenseness of a swimmer is the result of a mental tenseness that has never been broken down. Physical exercise will not relieve this condition. Generally, it is a combination of extreme nervousness and fear

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of the water; and, amazingly enough, many persons become fairly good swimmers without eliminating these two characteristics. Yet, their strokes testify to their thinking. Rarely is a full, easy, relaxed stroke swum by a person who has not learned to be mentally and emotionally at ease in the water.

The exercises from which a swimmer will benefit most are those which will increase confidence in the water. Distance work and absorption in the perfection of his stroke will help. Participation in informal water games and in group swimming will also be beneficial. One of the greatest assets of swimming clubs is the infectious love of the water that spreads throughout the membership.

Floating on the back with the arms sculling idly at the sides is extremely relaxing. It can be accompanied by a slight fluttering motion of the legs and easy, deep breathing. Surface dives after some object will make the swimmer forget his fear of the water. Plunging from an elevation a foot or so above the water is also fun. Leaping out in a racing dive the swimmer should coast as far as possible a few yards below the surface. He can make his body rise or sink by elevating or lowering his fingers. He can feel out the small currents. He can coast downward for more momentum, then plane upward as he comes to a stop.

Sometimes a swimmer lacks the knowledge of how to right himself or how to turn in the water, and this increases his nervousness. To bring the feet to the bottom from a swimming position, the arm pull need only be reversed. If on his chest, the swimmer should sweep his arms from the side forward, bending his knees, and his feet will be on bottom instantly. If on his back, he need only pull from his hips downward at the same time bending at the

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hips. Perhaps further practice in treading water so that he can remain on the surface with no great effort will make him more at home.

These and many other little tricks will round out a swimmer's development just as will the distance workouts and the practice with the pulling tubes and the kicking boards. Practice need never become tedious or monotonous, for there is too much to learn. The swimmer can, if he wants, set a special objective for himself each time he enters the water, gradually increasing his distance and the speed in which he swims it. Some may even want to measure their progress by the stop watch. Yet for most the satisfaction of knowing that their stroke is becoming a graceful effective thing, good to look upon and good to swim with, is enough.

Women and Swimming

THE MATERIAL IN this book applies to women as well as men. The point is emphasized here because the slower speed at which the former swim often leads to the conclusion that they are not able performers in the water. On the contrary, superior strength is the only important advantage which men have over women swimmers. In all other respects, women are a match for men, and in a number of departments they are even superior.

Greater speed is of course the result of greater physical power, but it has been emphasized many times that speed is not necessarily the badge of the good swimmer. Efficiency and smoothness, the ability to learn a stroke that gets one through the water as naturally as walking on land—that is the aim. And women have as good a chance of realizing it as men.

Instructors are usually ready in their praise of women swimmers. They will remark that little girls often make the best pupils, that women slip easily into the graceful and natural rhythm of the strokes.

There are a number of physical reasons to account for women's ability in the water. In the first place they have more buoyancy than men, because of their lighter bone structure and smaller muscles and the smooth layer of fat

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tissue which is evenly distributed over the body. Because of this they float more easily, and need to expend less energy on keeping a horizontal position.

Other qualities in their favor are their flexibility and muscular coordination—prerequisites of the good swimmer. Because of lighter and longer muscles they can more easily and with less strain flex arm, leg, and thigh muscles provided they practice and keep themselves supple. Those who see great women swimmers in action usually remark on their grace, especially in such events as the backstroke, where the liquid rhythm of the movements is a testimony to suppleness and relaxation (Figure 39).

Another factor making for able women swimmers is of a very practical sort. For one reason and another, they seem better able to stand the cold water of lake and ocean than men. Who has not sympathized with the muscular youth who stands shivering on the beach if the day is cool, while his smaller woman companion frolics in and out of the water?

A recapitulation at this point would hardly find the woman swimmer in a secondary position. Let man's stronger and heavier muscles carry him faster through the water—she can demonstrate an ease and coordination in her stroke which he would do well to emulate.

Technique

With only a few exceptions the rules that apply to men swimmers are also taught to women. One of the fallacies women sometimes lean towards is a too rapid kick. Because they float easily they tend to accelerate their kick, sometimes using an eight- or ten-beat flutter in their crawl

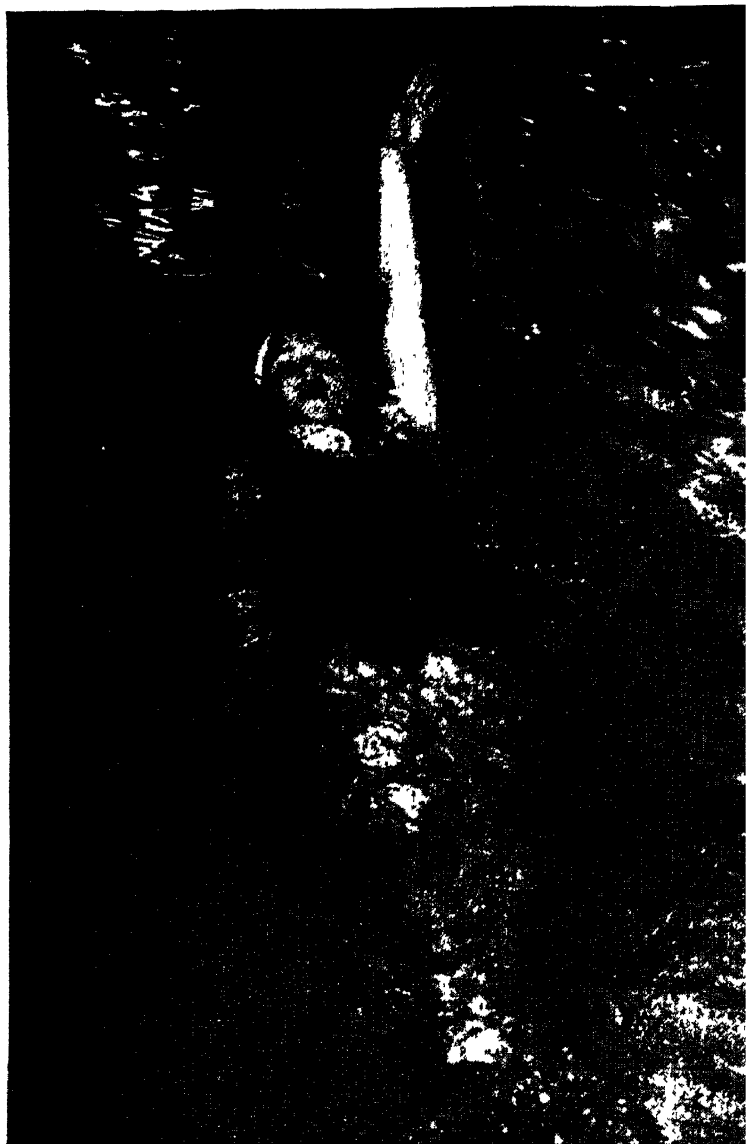


FIGURE 39. A smooth stroke for supple muscles.

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stroke, breaking the surface with extreme violence. Effort should be made to lower the legs, to shorten the kick, and to attain a more even relationship between the work of the arms and the legs. For example, in order to have proper synchronization, a ten-beat kick would require a very slow arm recovery. Some women can comfortably hold an eight-beat kick, but they should not do so at the expense of the arm stroke. As with the men, perhaps the most successful rhythm is based on the six-beat flutter (Figure 40, A-D).

Some feminine swimmers copy men in trying a long hard pull under water in the crawl stroke; but the shorter pull and quick recovery of the new crawl or free style will make for less strain and put their buoyancy to greater profit. The long pull—like that of the early crawl—requires great strength and leverage, with the hands, arms, and shoulders all working harder.

The head should be held fairly well up in the crawl, but not so high as to strain the neck muscles. An attempt should be made to crane the head forward a bit and pillow it comfortably in the water.

In strokes other than the crawl, practically the same methods are used by both women and men. Women's achievement in swimming is not limited to any particular stroke. They swim equally well in crawl, breast, and back-strokes, with some notable competitors such as Katherine Rawls demonstrating superiority in all three.

Training

Women competitors should train faithfully, but not as strenuously as men do for similar races. Their schedules should include plenty of long easy swims, with sprints once



FIGURE 40. For women a small flutter kick of this sort is often best.

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or twice a week and time trials at rare intervals. Dry-land exercises are beneficial, with any of the suggestions made for men swimmers adaptable for use. Deep-breathing exercises should be tried frequently to help develop the lungs and the pectoral muscles, a conditioning which adds greatly to the swimmer's endurance as well as giving the body greater symmetry.

Diving

In plain and fancy diving women have made a remarkable showing when one considers that a quarter of a century ago they rarely went near the water and only when encumbered by pounds of swimming equipment. Here their natural grace can be shown to advantage and they can fully capitalize on that suppleness which is one of their greatest assets in water sports. Further, they sometimes seem more willing than men to spend those hours and hours of practice necessary to perfect diving technique, and their performance on the high and low boards compares favorably with that of their male rivals. They may not be so proficient in some of the somersault dives, lacking the strong, vigorous muscles needed for these movements and the power to attain sufficient height, but otherwise their limitations are no greater than men's.

Look at any rotogravure pictures of the champions in women's swimming today, and you will find graphic evidence of what the sport can do for women. The modern strokes tend to develop symmetry. They do this not alone for competitors but for any women who will go to the water for regular swims—for anyone, that is, who will make swimming an active hobby.

Fancy Diving

IF THERE IS a diving board in a swimming area, almost everyone who goes there to swim uses it. Why? To many it is a challenge. To others it is the chance for a thrill. To still others it is an opportunity to exhibit their physical grace and skill for their own satisfaction, and often for the benefit of admiring spectators.

It is too bad that the statement made so confidently about swimming cannot be applied to diving—that almost everyone can learn to be a “complete” diver. Diving demands more than its companion sport. Swimming affords an opportunity for slow practice and the repetition of movements over and over until they are right; but not so diving, which requires movements in the air that must always be performed at a considerable speed. Many persons simply cannot achieve successful control in the air. Yet this should not deter any physically normal person from trying it. Fortunately, the dives are of varying degrees of difficulty, so that the beginner can start from the easy plain front header or from the front jackknife and by slowly developing become a finished performer with a large repertory of fancy dives. And even the simplest dives are enough to justify the time and effort required to master them.

Progress in diving is similar to that in swimming. First,

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the elementary dive off the edge of a pool, dock, float, or platform is practiced; and this is a purely functional dive which every swimmer must learn. Second, there is the long process of acquiring the fundamentals and a certain degree of perfection in the basic fancy dives. And, finally, the diver's skill justifies testing himself against others in competition. As in swimming, the technique for competition is the same as that for the average, everyday diving of the person out to enjoy himself.

Fancy diving is done from platforms of varying heights, and from springboards usually three meters or one meter above water—"high" and "low" boards as they are called. Diving in competition is generally from these low or high springboards and consists generally of the performance of five required and five optional dives, the former being a series of fundamental dives that every contestant must perform, the optional being dives of his own choice. The dives are accorded a rating of one to ten points by the judges on the basis of their degree of perfection—how near they come to that ideal dive for which everyone is trying. Every dive has an established degree of difficulty which, when multiplied by the award of the judges, gives the total score of the dive. The scores are cumulative, and the diver with the highest total of points wins. The rule books list most of the important dives, placing them in five different categories, and this is how they will be described here.

Elementary diving from a rigid surface has already been discussed, but perhaps before undertaking fancy diving from a springboard the learner should briefly review the knowledge of diving he has already acquired.

The head, for example, was found to be the controlling factor: when it is dropped, the body dips downward; when



FIGURE 41. *Top*, A swan dive.

FIGURE 42. *Bottom*, A half-gainer.

Fancy Diving

it is raised, the body stretches outward. It will be important to remember the functioning of the head during the performance of the more difficult dives to come.

The arms were shown to play two important roles: they contribute not only balance but also additional power to the spring; when held together, they also furnish all the protection needed for comfortable entry into the water.

The spring of the legs was found to make the difference between a sprawling and a neat entry. Inasmuch as the legs tend to lag, their thrust is helpful not only to send the body upward or outward, as is desired, but to lift their own weight and that of the hips high enough and far enough to follow through the hole made in the water by the arms, head, shoulders, and chest.

Fancy diving will be started from the low, or one-meter, board—principally because it is safer and gives the beginner more confidence. This low board will probably be a long, limber piece of wood from fourteen to sixteen feet in length and twenty inches wide. It will project over the water about three feet, and the water beneath ought to be at least nine feet deep and clear of all obstructions. If this is the latest type of board, the diver will have the advantage of a movable fulcrum which can be shifted to adjust the spring of the board to his weight.

The value of the springboard is obvious. It helps the diver to mount high enough to perform somersaults, pikes, twists, and other movements with grace and precision.

Fancy diving is an art, a skill demanding persistent, conscientious endeavor. If there is any short way to success, it may be a dangerous one. Those interested in fancy diving should approach it in the full realization that it calls for careful study of technique, strict compliance with a few

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fundamental rules, and willing attention to details. They will get no enjoyment out of it, and it may even be dangerous, if undertaken carelessly. On the other hand, if they are willing to take it slowly, mastering the fundamentals and incidentally tasting the fun to be found in the process, progressing, where possible, with the help of an instructor, then their experience is almost certain to be a satisfying one.

Springing the Board

It may give the beginner confidence to know that lack of jumping skill on solid earth does not necessarily mean inability to get height from the springboard. This is a special ability depending largely upon the skill with which the diver learns to time his spring with that of the board as it flexes and recovers under the shifting of his weight.

Let the diver take a position near the end of the board, facing outward toward the horizon or the far end of the pool, his body nicely erect, his head up and arms extended at shoulder level. He may already appreciate the fact that there is a sensitive, lively thing beneath his feet, ready to respond to his every movement, but he can convince himself of the point by lowering and raising the arms several times, thus shifting the body's weight up and down slightly, and by then bending and pressing downward with the knees simultaneously with this arm movement.

This gives some inkling of what to expect from that flexible piece of wood and matting beneath his feet. It is now possible to learn how to develop the potential spring that the board promises. This is done by adjusting a strong arm swing to the yielding and tensing of the knees as if

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preparing to leap into the air. The arms drop to the side, then spread to shoulder height, causing the body to rise on tiptoe, legs springy. Then, as the arms swing backward, down by the side, and up in front, the legs bend and straighten. Again the arms go through this series of motions coordinating with the bending of the legs; but this time a real upward spring can be attempted. The first time the board probably tossed him a few inches despite the fact that he did not spring. In each spring from now on he will try to match the lifting effect of the legs with that of the board.

Now for some real fun. He can begin to bounce gently with the give and thrust of the wood, swinging the arms with a backward-down-forward revolution with each bounce. Gradually he will gain height, taking care to hold his body erect so that the spring is imparted from foot to head. The head can be bent forward a bit to watch the end of the board.

Aside from his newly acquired knowledge of waiting for the "give" of the board and springing with its "thrust," what else has the diver acquired from his persistent bouncing? Height, for one thing, and this is most important. Balance for another. An erect, symmetrical take-off position, head up and toes pointed, for still another. All these without even entering the water.

Jumping or diving from the bouncing position is possible but rather difficult and is not permitted in competition. Right now, however, the diver is more interested in the hurdle which enables him to get a good solid thrust without bouncing.

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The Hurdle (Figure 43)

Preceding the actual take-off into the dive, this short leap allows the weight of the body to be thrown heavily enough on to the end of the board to give it close to a maximum bend. From the walking position of the approach the diver leaps from one foot, lifting the knee of the other leg high, as if he were really jumping a small hurdle.

Straining for too much height on the hurdle may cause lack of balance. It is better at first to leap just high enough to make the board give beneath the feet. If necessary the whole body can be leaned forward slightly, but it should not be bent at the hips.

The hurdle starts twenty-eight to thirty inches from the end of the board and can at first be practiced from that point without a longer approach.

Approach (Figure 43)

Just as a short run makes it possible for a high jumper to clear greater heights, so three or four smooth swift strides, the number and speed of which each diver can best determine for himself by trial and error, are used as an approach to a dive.

For some reason, possibly because he is too tense, the beginning diver may find it hard to make this approach without wavering from side to side in uncertain balance—"casting," in diving parlance. This will vanish as soon as the steps are suitably spaced and the diver ascertains which foot is the more convenient for taking off into the hurdle.

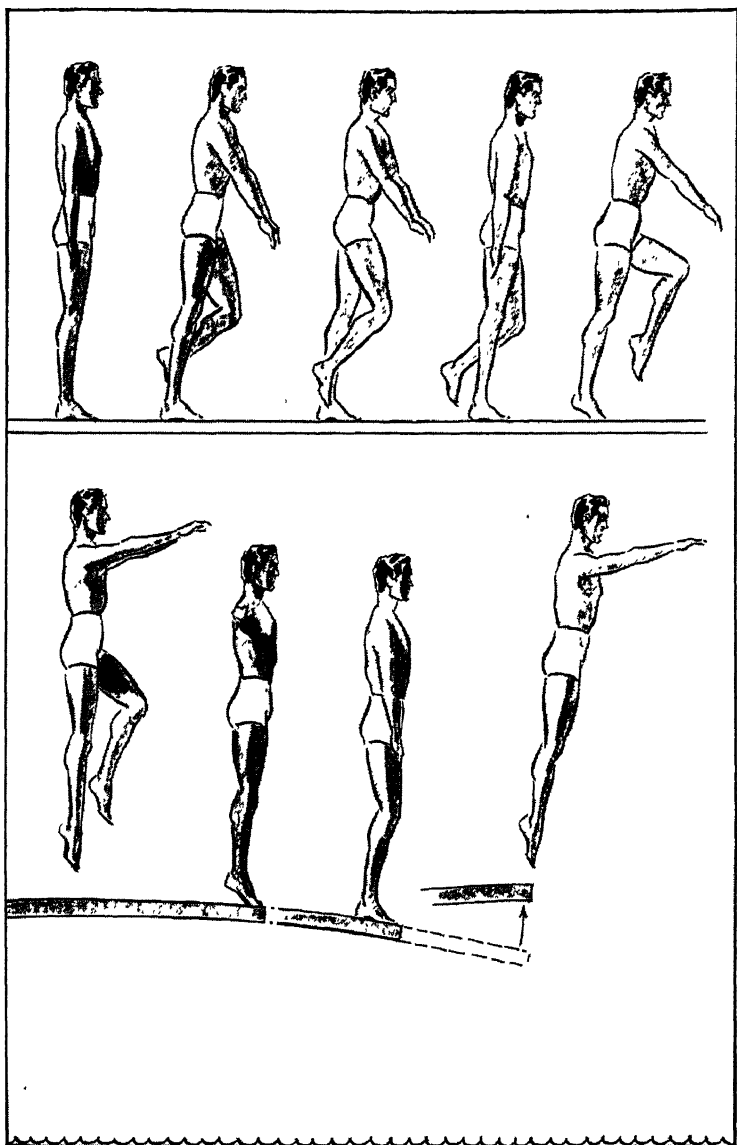


FIGURE 43. Approach, hurdle and take-off.

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Sometimes placing a small piece of adhesive tape to mark the position of each step is helpful.

Already aware of the value of the arms for obtaining lift and balance, the diver can now coordinate them into the approach. Swung slightly forward on the first step and held in that position on the second, they are dropped to a point slightly behind the thighs on the third (if this is a three-step approach); from there they rise with the hurdle to a line with the shoulders. The crouch and spring are then accompanied by the arm movements previously described in the section on bouncing.

Leaping with the board, taking off into the air, hurdling, and approaching are all fundamentals which call for patient, persevering practice. With increasing proficiency, much of the prospective diver's uncertainty and apprehension will vanish.

Into the Air (Figure 43)

Although most beginners are afraid of hitting the board, this is not likely. By leaning an inch or so forward, they can assure themselves of ample clearance. Three interdependent factors determine a diver's position in the air—angle of take-off, height, and distance from board. As a general rule, the diver should try to make height as constant as possible for all dives, never consciously varying the force of his spring. By examination of the position of the body as it leaves the board in the different sketches, the varying degrees of necessary body-lean will be apparent. Jackknife dives, high and close to the board, call for hardly any outward lean; tumbling forward dives require that the body be farther from the board. Attempts to get too

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far out from the board will result in loss of height and make it more difficult to complete the motions of the dive.

A good running take-off with the body in the correct position may lift the diver five and one-half feet from the board, while a similar standing dive can carry the body up three and one-quarter feet. Some divers will of course go still higher than this with ease.

Entry

The entry into the water is not the high point of the dive, but it is that last neat touch that marks a job well done. To come out of a spin or a twist and knife easily into the water is a sure sign of complete control and poise; and as the dive is not finished until the body is completely submerged, the entry should be perfect.

A poor diver is always bothered by the heaviness of his body as it hits the water; a good diver on the other hand often wonders as he cuts a small hole through the surface what has happened to that strong pull of gravity one hears so much about. The difference in reaction at entry is due almost solely to the position of the body. If his body were aligned rigidly from head to toes, arms together in a wedge, legs streamlined behind, toes pointed, knees together and stiff, the top of the head pointing at the water, if, furthermore, the position was perpendicular to the surface, then the diver would hardly know there was any water there at all.

If the arms are not in line with the rest of the body and held firmly in place, they may be wrenched one way or another by the impact and thus overthrow or underthrow the body. In dives in which the entry is feet first, the arms

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are wedged against the sides as if they grew there. By concentrating on the position of the arms, the diver will soon instinctively adjust them properly for that enviable clean entry.

The entry is more likely to be successful if the body is permitted to glide straight to the bottom, where the fall can be cushioned on the outstretched hands. If possible, the shoulders and chest should be stretched forward a bit to eliminate any arch which may remain after a swan dive. Although a slight arch may follow a back dive or a half-gainer, it should be reduced as much as possible. An arch will act like a rudder to throw a body too quickly from its extended position.

FIRST GROUP—FORWARD SPRING DIVES

The dives may be classified according to the position of the body on the springboard at take-off. There are five groups: forward spring dives, body facing outward toward the water; backward spring dives, body facing inward toward the springboard; gainers, with a forward spring and backward dive; cutaways, with a backward spring and forward dive; and finally, all twist dives.

Many of these can be performed with a layout, a pike, or a tuck. In the straight, or layout, style the body does not bend at the hips. In the pike the body is bent sharply at the hips, in jackknife fashion, the hands near to or clasping the ankles. In the tuck, the ankles and knees are hugged closely up against the thighs and chest so that the body is in a small, tight ball. The layout is often the most graceful technique but is generally the most difficult. The pike is somewhat harder than the tuck.

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Inasmuch as there are more than forty-two different dives of all types and degrees of difficulty, it is impossible and unnecessary to describe all of them here. A few of the more fundamental dives will be selected from each group for analysis; by thoroughly learning these, the diver will be able to move onward to any others which may please his fancy. If he is well grounded in the plain front dive, a front one and one-half somersault, a back somersault or back flip, a plain back dive, a back jackknife and a front dive with a half twist, progress can be made with safety and confidence to the double somersaults, full twists, and the combinations of both that are possible. Although the dives will be treated here according to their classification, and not necessarily according to difficulty, the diver may want to shift from one group to another, picking the easier ones.

All dives can be performed from the one-meter or the three-meter board. The technique is the same for both. Generally they are learned from a low board to eliminate as much as possible the stinging impact of a poor entry. The diver will later find, however, that shifting to the high board makes diving easier because the added height gives him more time to execute the necessary motions. The dives may also be done from a standing or running position; the former generally is the more difficult position from which to start.

The first group includes a header, often called a swan dive, a jackknife, a somersault, a one and one-half as well as double, two and one-half, triple, and three and one-half somersault.

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The Front Header or Swan Dive (Figure 44)

The swan will give the diver his first experience with a dive in which the body remains straight and slightly arched throughout. It will enable him to spring upward to a considerable height and then turn and drop vertically without the necessity of jacking at the hips, as the average person learning to dive tends to do. This surprising feat is accomplished by imparting a backward thrust to the legs which sends them soaring a little faster than the shoulders and arms so that the body at full height is in a pleasing, slightly arched position and almost parallel with the water.

The head and shoulders do not point out or down toward the water but up toward the sky. The arch is slight and high up behind the shoulders, but is none the less unmistakable. In the take-off position the arms are extended, but as the dive nears full height they swing back on a line with the shoulders and look to the poetic-minded like wings as the diver is poised for a second or so before descending swiftly to the water. As an alternative, the arms can be left extended forward throughout the dive.

The beauty of this dive is in the soaring flight of the body; but the effect cannot be obtained if movements are jerky, if the legs are flipped or kicked backward rather than moved there as part of the regular kick of the dive, if the arms snap into position, and if the body curves and strains.

If there is a proper adjustment between the backward thrust of the legs and the height to be achieved, the body will continue to tilt forward after reaching the "swan" position, the head and shoulders dropping. Prior to entry

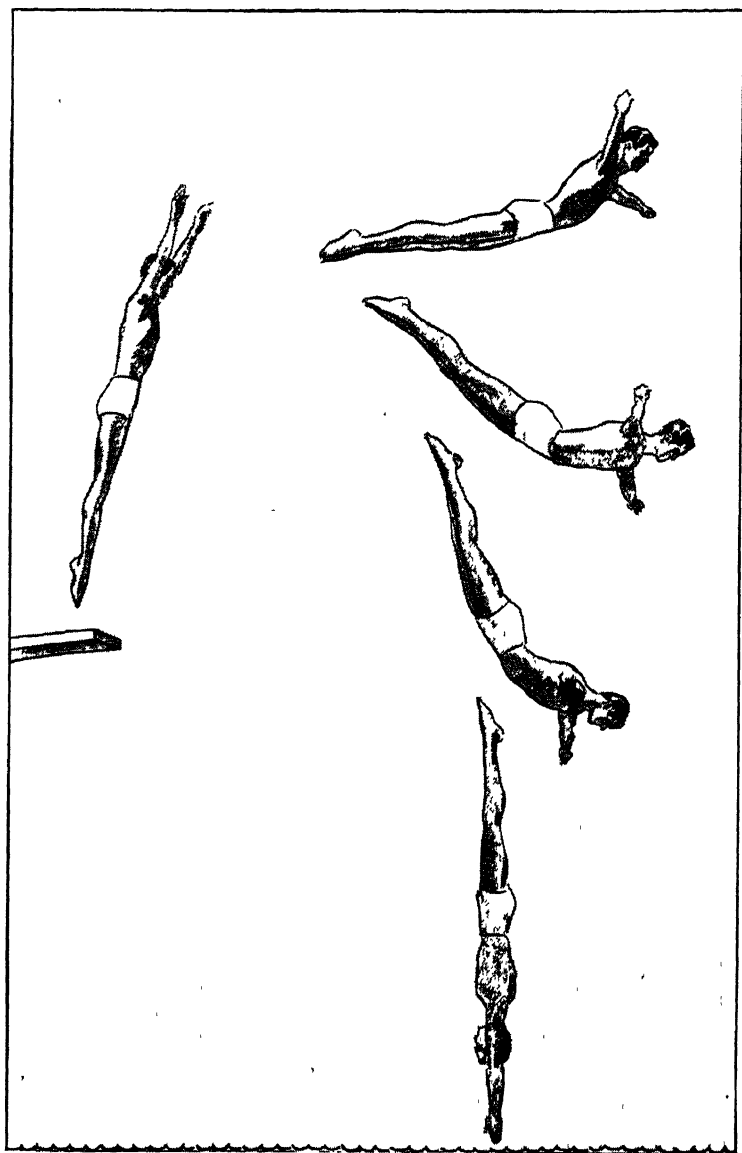


FIGURE 44. Swan dive.

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the arms are swung forward again, straight and close together; the head is dropped from its slightly raised position; the legs are held even more stiffly, knees locked, ankles together, toes pointed. The whole body now resembles a falling arrow. The arrow enters the water two or three feet, rarely more, out from the end of the board.

The Front Jackknife (Figure 51 reversed)

The easiest way of getting height in a dive without running the risk of landing flat on the water is to do a jackknife. Often a diver in a badly timed swan dive will suddenly be seen to jack in an effort to throw the legs higher than the head and prevent a "whopper" on entry. In a true jackknife, however, the open-blade position, in which the body is bent and the hands touch the feet or the ankles, is sought as a natural part of the dive. The diver conveys the impression of flowing into it and then flowing out of it again.

One thing he does not do, that the average person is likely to do, and used to be taught, is to snap the shoulders and head downward to complete the "jack." This is utterly wrong and will generally permit the swiftly rising legs to topple the body with no end of confusion. The "jack" is achieved by leaning the shoulders slightly forward, arms raised, and permitting the hips and legs to rise until the ankles or feet can easily be touched. The shoulders and upper trunk bend down, true, but only because of the upward movement of the lower part of the body.

The take-off in this dive is almost straight upward with no backward movement of the legs as in the swan. The arms are not stretched overhead but instead are raised shoulder-

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level where they poise during the upward flight and until it is time to reach for the legs. The head is erect and looking toward the horizon or the gallery at the far end of the pool until the jackknife position is sought. The arms and legs do not bend, the knees and toes are always pointed, and the knees are together.

Mastery of the jackknife is important, for this is the fundamental pike position to be used in a number of more difficult dives. Rigid extension of arms and legs often constitutes the difference between a sloppy jackknife and the neat crisp dive that this should be.

The Front Somersault with a Tuck (Figure 45)

This is another valuable basic dive because it teaches familiarity with the tuck position and the somersault which are the fundamental ingredients of so many good dives. It will be the diver's first experience in turning away from the water during the execution of a dive. It is simple enough, its sole claim to fame being the single somersault, which is like that which a person can take by rolling on the front lawn.

The take-off resembles that of the front or swan dive, and almost full height is sought in the extended position before it is time to tuck the body together and to spin. The feet are snapped upward, the hands clutching the knees and pulling the shoulders inward until the chest and knees touch. The hands grasp the shins just above the ankle.

Now the diver spins, and it is up to him to "feel" when it is time to come out of this spin and drop neatly feet first into the water. Since it takes a certain amount of time to

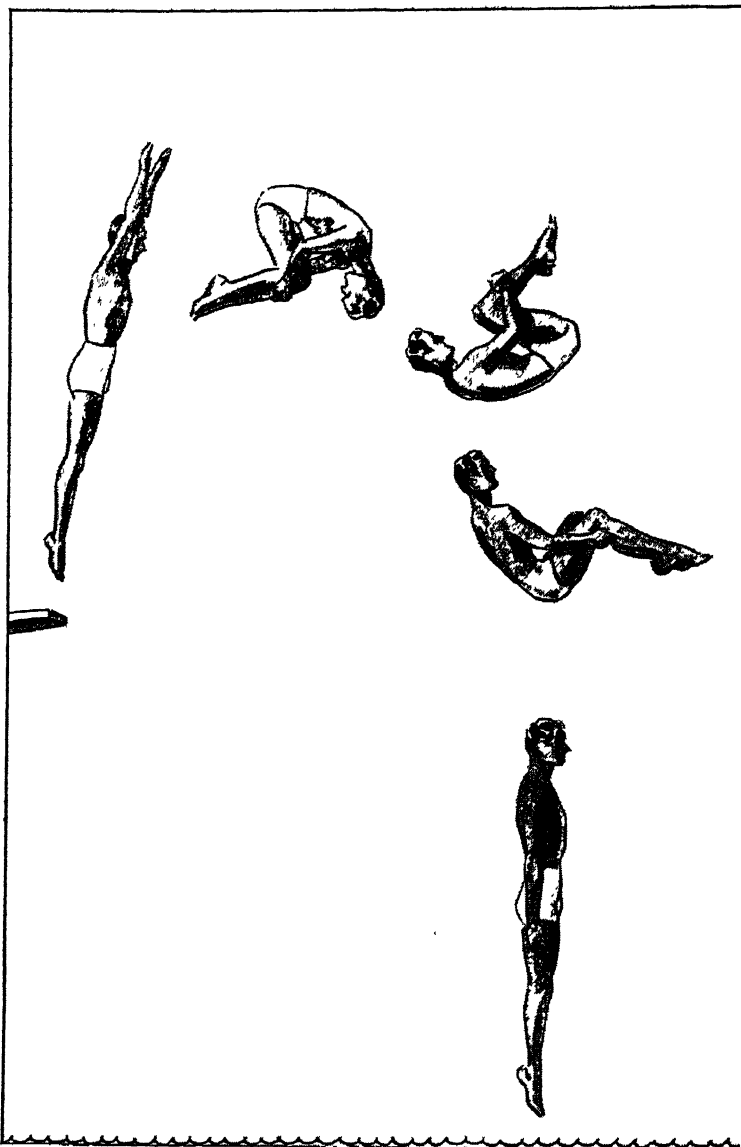


FIGURE 45. Front somersault with a tuck.

Fancy Diving

unfold the body, stretch out the legs, and achieve a stiff, well aligned position, the tuck should be abandoned before the head points at the sky. It is best at first to begin to unfold almost as soon as the tuck position has been reached.

There need be no haste in getting into the tuck. The body can be allowed to reach almost full height before the quick spin is necessary, and the diver will still have plenty of time to straighten out.

Practice can take place on an extremely low board, so that inability to open properly will not make the diver's first experience with this dive an unhappy one. At first, a backward flip of the legs can be emphasized at the expense of height, although this should not continue for long.

Entry feet first can be just as slick as headfirst if the toes point the way, the arms are clasped to the sides, the legs together, the head up, the whole body forming a straight line.

The Front Somersault with a Pike

Here is a chance for those skilled in the tuck somersault to try it with a pike.

Again the swan take-off, legs pushed backward so that the body is already in a slow spin when nearing the top of the dive. The head, shoulders, and arms are then swung or rotated vigorously down, arms straight as the hands grasp the ankles.

The revolution is slower than in the tuck, but there should be ample time to come out into a flat, extended position. The upper trunk is straightened, the chest thrown forward; the head is raised, and the hands glued to the sides as the body drops in the feet-first entry.

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In a good pike the legs and arms are straight, and only the trunk bent.

The dive can also be tried with a layout by the most experienced. This is extremely good to look upon, for the body spins more slowly than when tucked or piked. Good height and timing of the backward thrust of the legs are necessary for its successful execution.

By now worry about clearing the board is a thing of the past. The diver may have discovered that the bend in the springboard thrusts him outward as does the forward momentum of the hurdle, and that he tends to lean away from the board anyhow. It may be time to take stock to discover whether his springing position is such that the force of the board moves straight up from ankles to neck. The somersaults have also demonstrated convincingly how important an aid to spinning is the position of the head. Generally the head is inclined in the direction of the somersault, the rest of the body turning obediently with it.

If there is a tendency to topple too far forward in coming out of the somersault, it can be partly offset by arching the back and raising the chin. Any such tendency is generally due, however, to haste in assuming the pike position before adequate height has been reached. If on the other hand there is difficulty in completing the spin, then it is taking place too late, probably at or shortly after full height.

The One and One-Half Somersault with a Pike (Figure 46)

The one and one-half somersault with a tuck follows in this series, although some believe that it is easier than the

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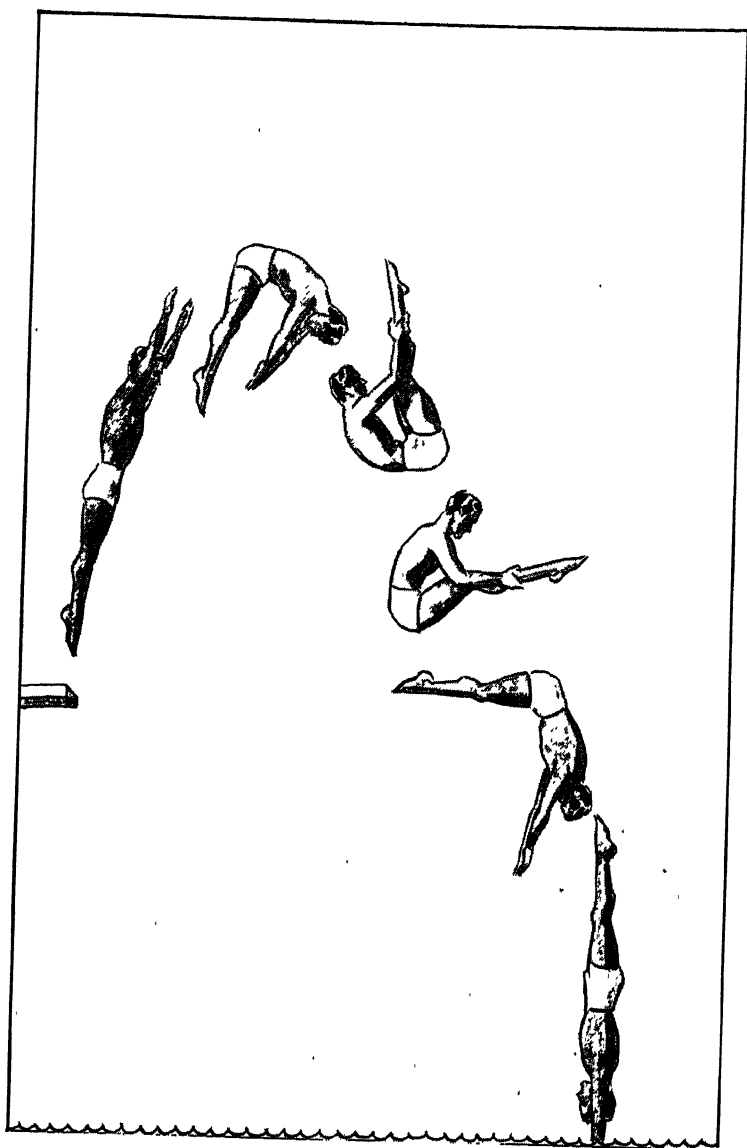


FIGURE 46. Front one and one-half somersault with a pike.

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single somersault. Here the spin lasts longer and the diver can tell when the right time has arrived to straighten out by watching for the water as he turns. Although the backward thrust of the feet in this and the other forward somersault dives helps the spin, the diver must not be content merely to bundle into a ball and hope for the best. The head must really be pushed in the direction of rotation, the shoulders too.

Some like to practice the somersaults from a standing rather than a running approach, although this is considerably more difficult. Those who find that they are not completing their spin in the one and one-half should strive for more height.

SECOND GROUP—BACKWARD SPRING DIVES

Roughly in the order of their difficulty the dives that are made from a position on the board in which the diver faces inward are the backward header, somersault backward, one and one-half, double, and two and one-half somersault backward.

All of these so-called back dives are from a standing position, no running approach being possible. Not many attempt to practice bouncing the board in this position but trial springs can be taken by poising on the end and then making a single high leap. Having learned the value of the approach and hurdle in enabling him to achieve height, the learner may now be a bit surprised to realize how much of a lift can be obtained from this standing position. Good height can be achieved in the back dives because the diver stands on the extreme edge of the board where it is most flexible and because in this position a strong thrust of the legs is possible.

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Standing at the base, he walks to the end of the board and there pivots carefully balancing on the balls of his feet on the edge, heels high and together above the water, legs tense. By extending the arms at shoulder level over the board, he can hold this position without leaning the body forward for balance.

Ready to spring, he circles the arms sideways, backward, and forward—just as in the forward dives—combining this movement with the bend of the knees. The arms reach over the head in the take-off.

The Plain Back Dive, or Backward Header (Figure 47)

For the first time the learner will not be able to see the water when diving. Because he has discovered by now that proper regulation of the body, particularly the head, is a guarantee of a safe entry, he can approach this new experience with no little confidence. He may be surprised and pleased to find that if he had any fear of the consequences when he first began to dive, it has now vanished.

The problem in the back dive is, as in the swan, to spring to a considerable height and still get from a head-up to a head-down position. The backward thrust of the legs that made this achievement possible in the swan is not used here. Instead it is accomplished merely by dropping the head backward and bending the upper part of the trunk, especially the shoulders, toward the surface below.

To learn this key movement, the diver can practice falling backward off the board a number of times, arching head and shoulders toward the water. He need only stand on the end of the board and, raising the arms over the head, thumbs touching, look backward toward the water,

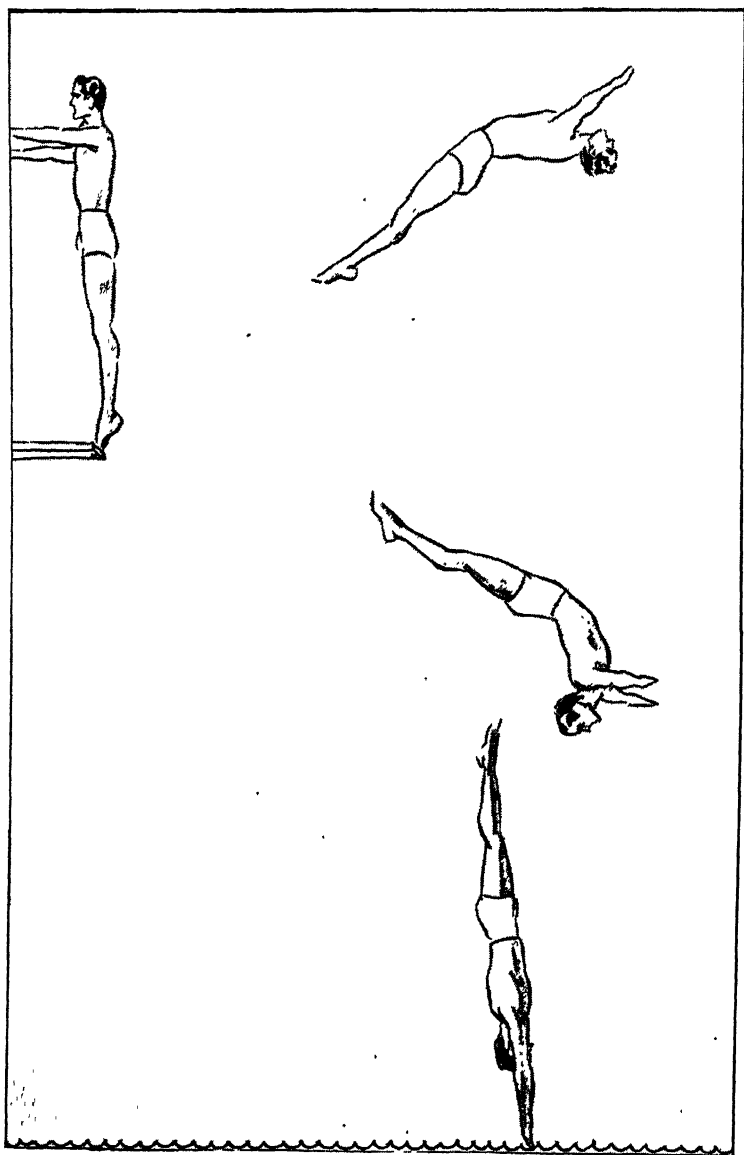


FIGURE 47. Back dive.

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curving the trunk as he does until he topples in. It is to be presumed that by now he knows better than to lift the head as he falls, and so no warning is necessary here. The legs can be temporarily disregarded; entry will probably be so close to the board that they will not lag or slap the water.

Having become somewhat familiar with the backward entry, the diver can now take a few little springs, straight out rather than upward. In these low headers there is a chance that the body will flip over because most of the spring is given to the legs and hips. This can be remedied by striving for more height, as the diver will eventually want to do anyhow, and by not leaning so far backward in the take-off.

In a properly executed back dive there should be but little backward lean, the diver concentrating on the attainment of height by poking the arms up into the air as if to strain them right out of their sockets. This extends the chest and the trunk and makes for a nice straight body. The head faces shoreward and is held erect. At the top of the dive, when the momentum of the take-off is about spent and gravity begins to take over, the arms may be spread so that they resemble the wings of an airplane or they may be left extended over the head. Either position is correct.

At the peak of the dive, the shoulders, head, and arms are pulled down toward the surface, the arch increased; and, with the body obediently following, a headfirst vertical position is achieved. A handsome entry is possible with the arms in line, the legs together, the head straightened just before hitting the water.

There is grace in that easy arch. It looks as if the diver had all the time in the world to get into position. Actually

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a lot of effort and careful timing is needed to do it correctly.

The Back Somersault with a Tuck (Figure 48)

This is sometimes thought to be easier than the single front somersault because the diver, by watching the water, can get a rough idea of when to open out.

It begins with the same spring and take-off as the regular back dive. As it nears its peak, the diver lifts his knees, drops his arms to grab his ankles, and tucks the knees right up against the chest. A question here for those who have already tried the front somersault: Which way is the head moved—backward or forward?

The temptation is to bend the head down toward the knees to get a good tuck, but it must be resisted. The principle that the dive always follows the head still holds here; and although the rest of the body may be in a tight ball the head leads the way backward.

The spin is quick, and as he spots the glint of the water the diver can open. The knees and trunk are straightened, the head brought erect and the arms pressed to the side. Entry should be feet-foremost and vertical, but in the first few trials will of course not be as good as that. It will take a little practice to know just when to come out of the tuck. If the diver is not revolving fast enough, then the head should be stretched back still more; and he should be careful, in assuming the tuck position, to pull the legs and hips upward rather than bow to meet them. If the diver is turning too far, so that he strikes into the water on an angle, then perhaps he began spinning too soon after leaving the board, not allowing himself enough height.

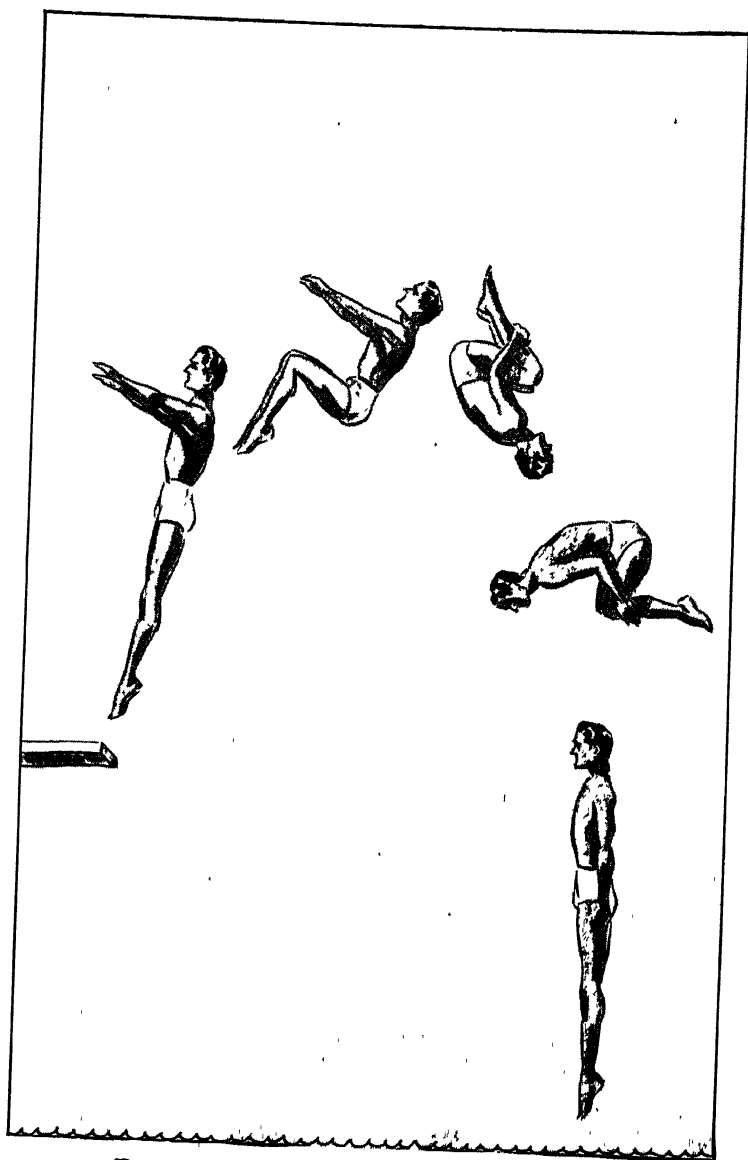


FIGURE 48. Back somersault with a tuck.

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The Back Somersault with a Pike

Being an easy somersault dive, this is a good one in which to try the pike and layout positions.

This starts the same as the regular back dive or the back somersault with a tuck. At the proper height, however, the diver, instead of lifting the knees high, raises the legs—knees stiff—as if they were to be carried right over the head and down into the water. The hands take hold of the ankles; the head and shoulders exert a strong backward pull, and in a second the legs are over.

The forces that are combined to produce backward rotation are the lift of the legs from the hips, the pull of the arms on the ankles helped by the backward thrust of the shoulders, and the backward stretch of the neck and head.

Before entry, the body is forced into a straight line to check rotation, the head held erect, the chest thrown forward, the hips stiffened, and in this neat position it drops into the water.

The diver already knows how the legs and arms should be held—or should it be emphasized once again that a bend at the knees or elbows or a spreading of the legs is always awkward to look at?

The Back Somersault with a Layout (Figure 49)

The problem: To make a complete backward spin with the body straight or slightly arched.

The solution: Forceful backward pull of the head, arms, and shoulders, particularly the last. Since there is no help to be had from the legs as in the other two back somersault dives, the upper part of the body does most of the work.

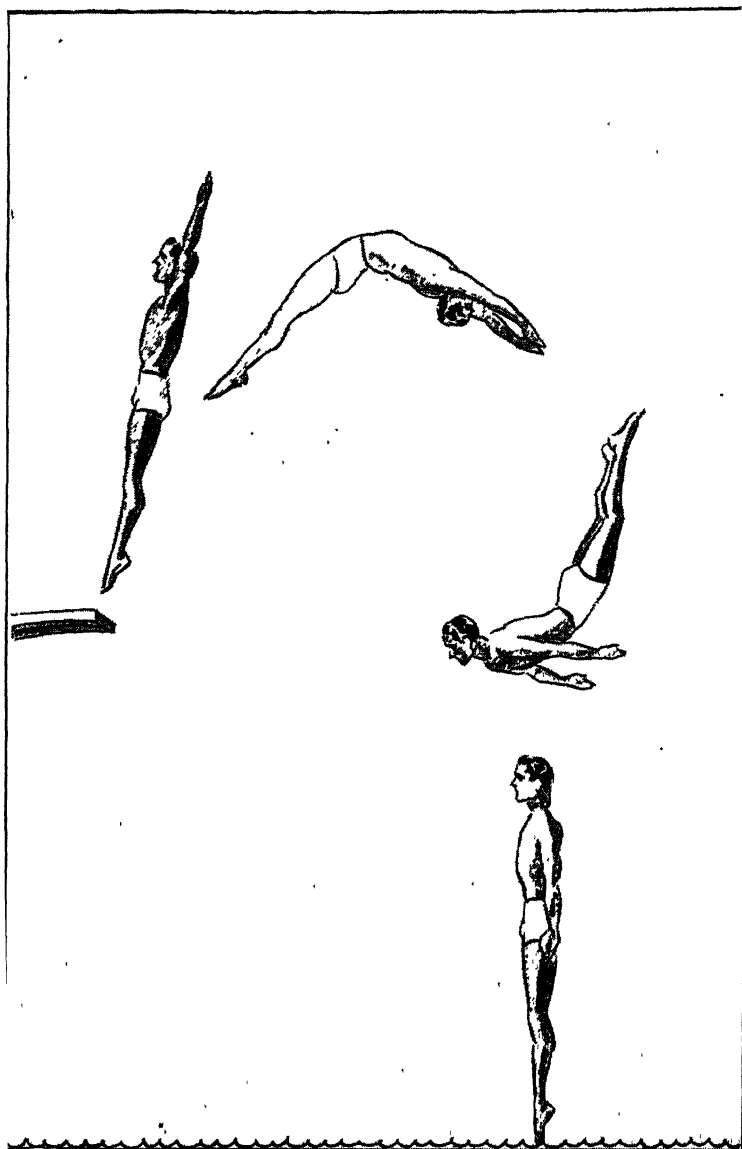


FIGURE 49. Back somersault with a layout.

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It can be ably assisted by the chest, however, which is raised, or thrust forward and upward, throwing the shoulders backward and arching the upper back.

From the time it leaves the board the head describes a small circle which is really the axis for the larger circle described by the feet. To stop the whirling movement of the body, the head is brought erect, the shoulders forward. The arms drop to the side in the entry, which is the same as in the other back somersaults.

The take-off is like that of the plain back dive. The somersault does not begin at the board, much as the temptation may be to do so. The spring should be straight upward. To try to throw the feet around in springing from the board would throw the body out of control and eliminate height.

It is now apparent that a few general principles apply to these back somersaults. The position of the head facilitates and accelerates spinning. The head is held back as long as the diver wants to keep turning, and is raised when it is time to straighten for entry. Emergence from a spin always begins with the extension of the legs, then of the rest of the body. The arms in all single somersaults always finish close at the side.

The master dive of this group is the backward one and one-half somersault, first with tuck, then pike, and last in straight or layout fashion. More spin than in the other dives is of course essential. The turning position is held somewhat longer, and the body straightened into a head-first entry. To know just when to stretch the head and shoulders into the downward pull toward the water is difficult. The diver will find learning simpler if there is some-

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one to watch his movements and advise him on the timing of his somersaults.

THIRD GROUP—GAINERS

These are forward spring dives with a backward entry—a back dive reversed. The more important are the Isander or half-gainer, the Mollberg or full gainer, the one and one-half, the double, and the two and one-half somersault Mollberg. The names, Mollberg and Isander, are said to be those of Swedish swimmers who invented the dives. Of all the dives off the low and high springboards these gainers with layout, pike, or tuck are the most beautiful to watch when perfectly executed. They represent an advanced type of diving which is best attempted after the diver is confident of his control in the fundamental front and back dives.

The Isander, or Half-Gainer Straight (Figure 50)

This is the fundamental dive of the group. Some instructors advise learning first the full gainer with a tuck, although experience has indicated that it is often very hard to perfect a half-gainer afterwards.

The half-gainer begins with the regular front approach, hurdle, and take-off, the body leaning slightly forward as it leaves the board. The head and shoulders are carried backward while the hips are lifted toward the ceiling or sky, the legs following closely. The body thus rises into a reverse swan position, the arms meanwhile spreading from overhead to extension to each side. At the full height of the dive, the head is looking in the direction of the board,

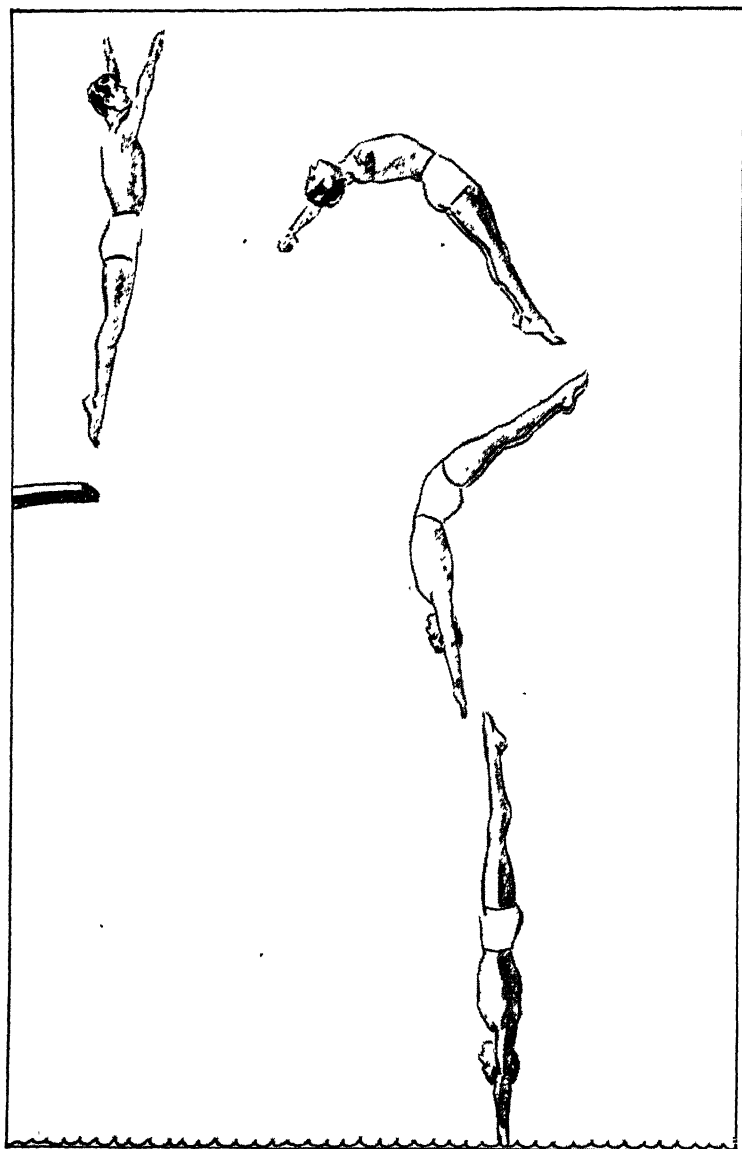


FIGURE 50. Half-gainer.

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the body arched. From this top position the head, shoulders, and then the arms lead the way into a vertical head-first entry.

The essential problem presented by this dive is thus quickly apparent—how to leave the board virtually erect, head up, achieve the reverse swan position and then a head-down entry. Its solution lies in lifting the legs and hips forward and upward until the horizontal or arched position is assumed, and then in pulling the head and shoulders down to the surface of the water, the rest of the body slipping obediently into line.

Most beginners are tempted to rush off the end of the board without bothering to take a good hurdle and spring, concentrating instead on throwing their legs as high or as far forward as possible. This makes the dive, if anything, more difficult. The more height in it the better, for this gives the diver the time needed to move gracefully into and out of the swan position. Therefore in the take-off a good full spring is necessary although it is combined with a forward or outward thrust of the legs. The momentum of a good spring will always throw the body clear of the board.

The smooth execution and poise that make this dive attractive will not be mastered at once, but its fundamental movements should not prove too difficult. It is unnatural to jump forward and bend backward, yet concentration on lifting the hips may help to overcome this difficulty.

The arms rise to or slightly above the shoulder level during the upward spring, then swing to the spread position at full height. From there they drop back of the head, straight and in line with the rest of the body to lead the

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way into the water. The arch of the body should be almost fully eliminated at entry.

The Full Gainer or Mollberg with a Tuck

This is similar in many ways to a back somersault reversed. The forward spring is the same as in the half-gainer, the body leaving the board upright and straight, the arms swinging forward and up. The head is then tilted backward, and the knees drawn up and clasped tightly to the chest. The spin will carry the diver over so rapidly that he will be opening into the vertical position as he drops by the board.

The full gainer can also be performed piked or straight.

The Full Gainer or Mollberg Straight

In both these gainer somersaults, a little faster spin than in the half-gainer is necessary to prepare the body for the feet-first entry. The head and shoulders are thrown back just before the dive is at its highest point, and this movement plus the upward and outward thrust of the legs spins the body in a single complete revolution.

The spin is stopped by raising the head, elevating the chest, and bringing the shoulders forward.

FOURTH GROUP—CUTAWAY DIVES

These are made from the backward position with execution toward rather than away from the board. The dives in this category are the backward spring forward dive or the back jackknife, the backward spring forward single

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somersault, and a one and one-half, a double, and a two and one-half somersault performed the same way.

Back Jackknife (Figure 51)

The basic and most simple dive of the group is the backward spring forward dive in the pike position, the back jackknife. Its technique is similar to that of the front jackknife, except that it is from a standing, backward position, and that it must be made toward the board. As a matter of fact the diver is more likely to seek a higher spring close to the board in this dive, and this of course enhances form.

The diver stands on the balls of his feet on the end of the board, heels high, body upright, arms stretched in front, head up. The arms are then swung in a half-circle as the body pushes downward to spring from the board, and the take-off is up and slightly backward. The hips are hoisted quickly skyward, the arms dropping toward the water until the hands are about opposite the ankles. The diver is now in the pike position. From here the head and shoulders continue to drop, the hips and legs straighten into line, and the arms are pointed to slip cleanly into the water.

To prevent the slight backward lean in the take-off from spoiling this dive, the diver brings his body to a vertical position or even to a slight forward lean, once it is in the air. The head and shoulders are not bent to meet the legs, as those who have already mastered the front jackknife know. Instead, the diver lifts with the lower back and hip muscles, the head and shoulders staying in the same relative position. Thus, the pike at the peak of the dive is

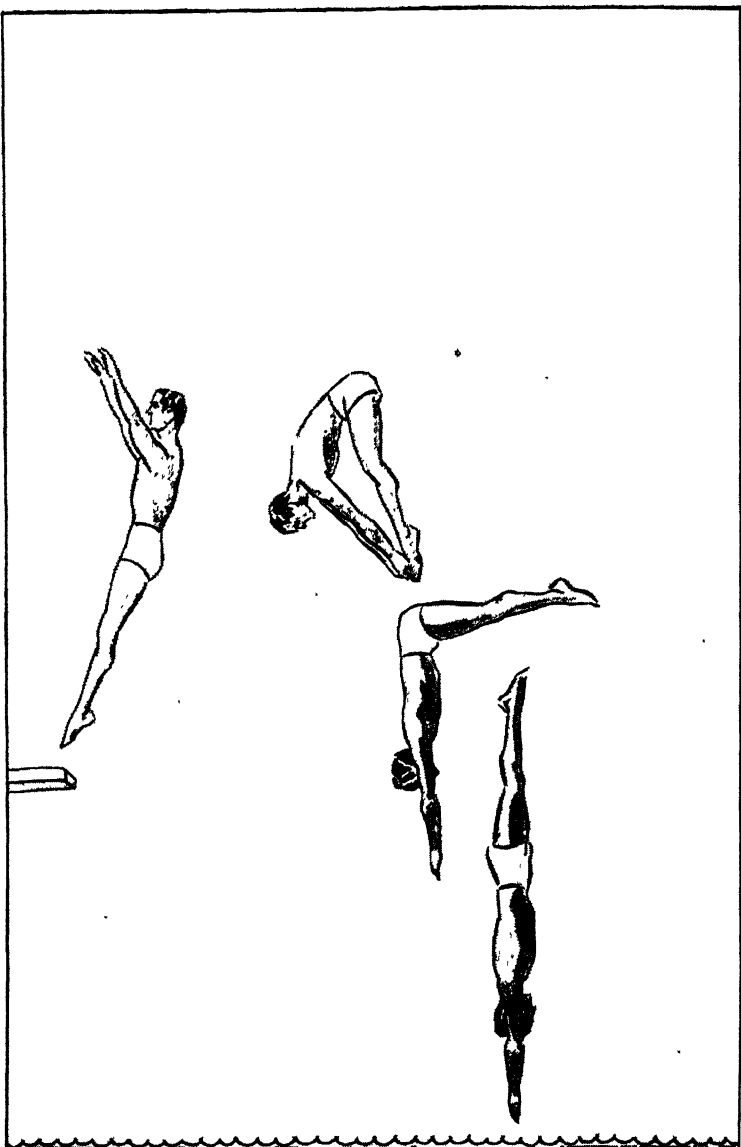


FIGURE 51. Back jackknife.

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reached smoothly, and with sufficient height for the diver to ease gently out of it until the body is vertical just before entry. Those who try to snap away from the board into the pike, then to snap out of it again, will have far more difficulty than those who seek height and the smooth lifting of the hips, the weight of which is sufficient to carry the body far enough from the board for ample clearance.

It is well to bear in mind that, in this as in all pike dives, the knees are kept straight, and such bending as needs to be done should be from the waist. The arms do not rise above shoulder level on the backward spring, but remain poised forward as an aid to balance. Most of the upward straining is done by the shoulders.

In first attempts at this dive, no effort need be made to touch the ankles; indeed this is not necessary in the most finished back jackknife. The high position of the hips is the primary objective. If a bit apprehensive of hitting the board, the learner may begin by executing the dive somewhat to the side of it, although this should not be continued long.

The beauty of this dive is the smoothness with which the body slides into and out of the pike position.

The Single Cutaway Somersault with a Tuck

In all cutaway dives, the first effort upon leaving the board should be to gain height. In the somersault the body stretches skyward, and the arms are raised above shoulder level before the body is tucked. The same type of spring as in the back jackknife is used. A fast spin is imparted by ducking the head while raising the knees toward the chest.

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The arms are whipped down to help carry the body around.

The somersault is about the same as the front somersault tucked. The head leads the spin, the knees are clasped tightly against the body, the shoulders curling in the direction of the spin. The head will spin in a semicircle; as it comes up toward the sky the legs and body are straightened, the head brought erect, and the diver strives for a vertical entry, pointed toes leading the way. The arms are of course held vertically at the sides.

Cutaway Somersault with a Pike

From low boards the somersault tucked is probably the best, but from higher positions it can be tried with a pike. In the latter the same take-off as in the back jackknife is employed, the hips rising; but this time the head and trunk are inclined down and under to lead the way in the circling movement. An extreme bend of the trunk at the waist is necessary throughout to preserve the pike position. The legs are straight, and the arms, at first raised over the head, can be spread at the shoulders until dropped to the sides for the entry.

The one and one-half cutaway somersault is next in the diver's development, but requires the mastery of a faster spin and surer timing, so that the diver may come out of his tucked or piked position in time for the forward entry.

FIFTH GROUP—TWIST DIVES

Twists can be applied to almost all of the dives described in the first four groups, up to and including the one and one-half somersault.

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Twisting brings a new movement into the learner's diving experience. Hitherto all turning has been made on the horizontal axis of the body and has consisted in the main of bending backward or forward. Twisting is on the vertical axis and involves turning the body over from a chest-down to a chest-up position or vice versa. Or it may involve a complete sideways revolution in which the body turns slowly over, and then back to its original position. Most twists start from the shoulders, are guided by the arms and completed with the movement of the head.

The Swan with a Half-Twist (Figure 52)

The take-off is the same as in the plain front header, and the twist is executed while the body is in upward flight, arms outspread. Without changing the direction or the angle of the body, the diver presses back with one arm and shoulder, holding the other arm and shoulder outstretched in swan fashion. The body swings over into the back swan position, and from there the head and shoulders are pulled down toward the water as in the back dive to achieve a vertical entry backward.

This dive can also be performed by raising one arm a little higher than the other upon leaving the board, permitting this arm and shoulder to carry the diver over onto his back. No matter which way it is executed, it is important to know when to check the backward thrust of the arm and shoulder before it twists the body too far. Twisting should never be started on the board, yet should begin before the peak of the dive is attained. It will be helpful for the diver to try to turn once he is clear of the board, and before he is at full height.

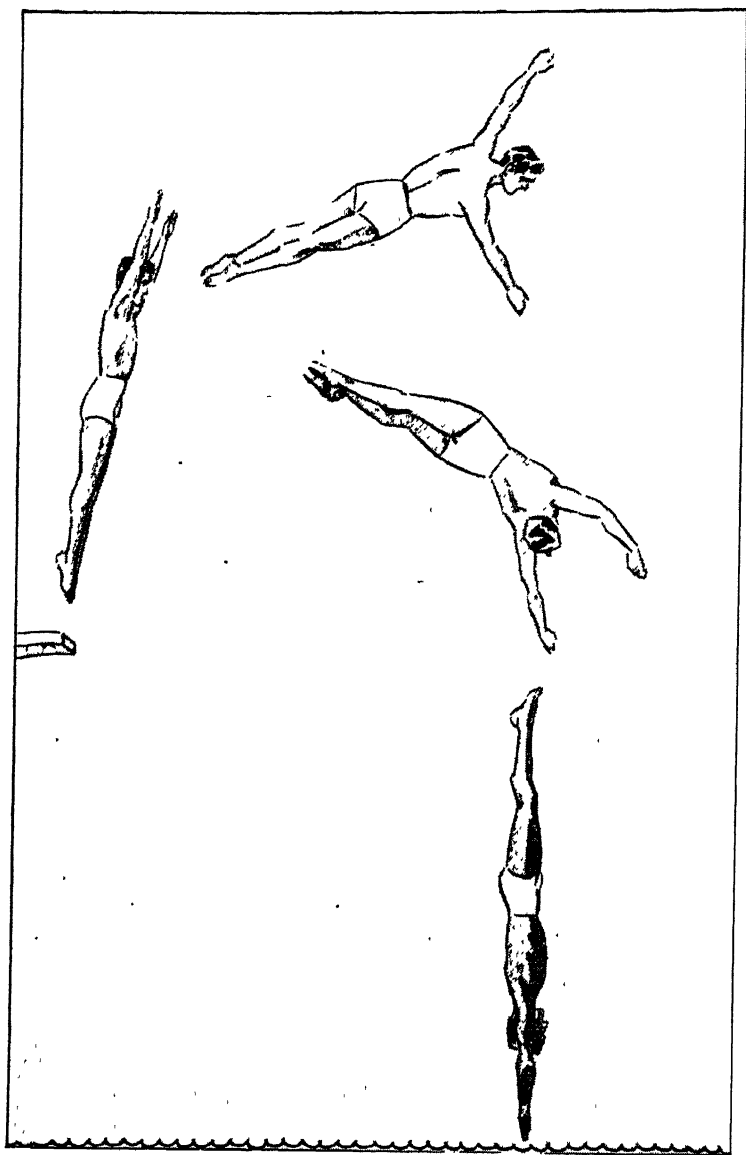


FIGURE 52. Front dive with a half-twist.

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The Front Dive with a Full Twist

The front dive can also be executed with a full twist, although the process is somewhat different from that described above. The dive begins at the same time and from the same take-off, but one arm is bent vigorously across the chest, carrying the body around onto the side, the face still pointed sideways toward the water. The pull of the arm then brings the body into the back dive position, the head now facing the sky. Then finally, the guiding arm thrusts up over the chest and, assisted by the head, brings the body face down again. From here a headforemost entry, body straight, is sought.

Diving Control

Many of the dives can be led up to by simple drills and exercises on land. Somersaulting, jackknifing, jumping backward, arching the back—all these movements can be practiced on a mat, on the lawn at home, or at the beach.

Standing erect, the prospective diver can imitate the pike or jackknife position by bending toward the feet without breaking at the knees. From the same erect position, with the arms extended sideways, he can raise one leg as if moving into a pike position, and can slowly swing this leg sideways and back parallel to the ground, the trunk, shoulders, and head straight and erect.

Lying on his back, arms stretched behind the head, the learner can raise the legs as high as hip flexibility permits. Then, with the legs on the ground, he can swing the arms over and down to the hips and back again. Finally, both arms and legs can be snapped upward so that they touch

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as in the jackknife or pike. Lying with his back slightly arched, with the arms braced behind the head, the diver can limber the trunk muscles by twisting rapidly from side to side.

The horizontal bar in the gymnasium can give the aspirant a taste of the diving movements. Hanging from it, arms overhead as if he had just left the board in a dive, he can practice swinging the body forward and backward; lifting the knees quickly; raising the legs halfway toward the pike position; bringing the legs up slowly to meet the arms at the bar and, if he is able, swinging the legs up over the bar. He can tuck the knees up toward the chest, and then drop, unbending the knees and holding the body erect and straight as in the feet-foremost entry. Performing even the most ordinary exercises before a mirror will teach the diver whether he is achieving a gracefulness of line and movement that is characteristic of good diving.

Competition

THOSE WHO WANT to try competitive swimming can do so in full confidence that their chances of success are good. The experience of Harvard University suffices as proof and is no different from that of other schools, colleges, or clubs. Harvard had had no team for a number of years when its new pool was built in 1929; and of the large group that reported for the first practice only one or two had had previous competitive experience. By the end of the first season, all members established average or better than average records, demonstrating that competitors are generally not supermen but ordinary swimmers who have made themselves what they are through hard training. In the following years the teams continued to improve; yet there were still a number of self-made swimmers. One recalls a boy who joined the varsity as a free styler of average ability, but who turned to the breast stroke because the team was weak in this event. In that same season, although he had never competed in the breast stroke before, he learned to swim it in world's record time. A backstroker who had had little interest in competitive swimming duplicated this feat, and one free styler, after a summer of exhausting practice, became one of the country's leading swimmers.

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The opportunities are many for both men and women. In winter, there is indoor racing; and in summer, outdoor competition. Teams and good coaching can be found in camps, public pools, Y.M.C.A.'s and Y.W.C.A.'s, clubs, schools, and colleges. And if the swimmer cannot find a team to join, he can always train on his own and participate in the A.A.U. meets which are conducted in most parts of the country. The A.A.U., the schools, Y.M.C.A.'s, and colleges generally hold local and sectional events culminating in national championships where the superior swimmer can test himself against the country's best and win consideration for the next Olympic tryouts.

It was not always so. Although in the days of the Assyrian or the Greek or Roman, swimming was popular, the records preserved do not show that it was organized on a broad competitive basis as it is today. Competitive swimming as we now know it began about 1837 with the formation of the National Swimming Society, which was later to become the British Swimming Society. At that time there were six baths or pools for men in London, and none for women. The new society held competitions in important cities and towns, and offered the winners the chance to compete against one another in London for a medal and chain worth twenty guineas. The man who won in the final races for four consecutive seasons became the "champion of champions" and the permanent owner of the prize.

About the middle of the century an amateur swimming association came into existence, and distinction was made between the amateur and the professional. From then on, the development of competitive swimming was gradual; yet even in 1900 it was not a sport of general appeal.

Competition

Greatest progress has been made since the World War, and now, with many countries so interested that competition is on an international scale, swimming is on a par with any other sport.

Age is not necessarily a qualification of ability although a person's fastest swimming age is probably between fourteen and thirty. Younger swimmers can compete if they like, but should take considerable care not to exhaust themselves or to reach their physical peak too soon. Under able supervision they can build slowly toward a successful future career. Whether, however, he is in his teens or his twenties when he gets the urge to test himself against others, the swimmer's first step is to get in all the aquatics he can. The summer months are an especially good time for distance work. Speed should be disregarded. With emphasis on form, a stroke can be cultivated at this time that is fundamentally sound and will catch the eye of the coach on the first day of practice. Form is what the coach will be looking for—not speed. During the habit-forming summer months the swimmer will do well to pay close attention to the correct fundamentals and try to be a harsh critic of himself. Naturally, he will seek as much authoritative instruction as he can get.

Roughly four months before the season opens, practice will become more intensive. Many authorities believe that physical training makes for a more powerful and enduring competitor, and recommend participation in regular sessions of calisthenics. These are designed to toughen and stretch the muscles but not necessarily to build extra muscle, which may only add to the burden to be carried through the water.

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A few basic exercises which will limber and toughen the important swimming muscles follow:

Most of the arm work involves extension and pressure rather than contraction, and therefore the extensor muscles should be brought into play. A combination arm and breathing exercise in the prone position, arms outstretched in front, is to press the palms on the floor, lifting the head, shoulders, and upper trunk from the hips, inhaling, then lower the trunk, exhaling.

From the same position, forehead on the floor, stretch the arms forward, raise them about twelve inches, bend them so that the fingers touch the back of the neck, and then extend them again. This can be performed several times without lowering the arms. A similar movement may be executed to the side.

Lock the hands behind the back and raise the trunk to limber the back muscles.

Raise legs, and kick them flutter-fashion.

Then combine these movements by lifting the arms and shoulders and the legs simultaneously from the hips.

All of the well known stomach exercises performed while lying on the back are helpful. In a series of motions, first raise one leg and then the other at right angles to the body, then both together. Bicycle riding, with the hips braced in the air by the arms, can be attempted. Swing the legs over to touch the floor behind the head. Finally, move them in a flutter-kick.

From a position on the back extend the arms backward, and press them against the floor to lift the shoulders and upper trunk. They can also be swung from the extended position to the hips and back again.

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Then combine the leg and arm movements to form an inverted jackknife by raising both simultaneously so that the fingers and toes touch overhead.

These movements are too taxing to be performed for more than a few counts in the first session. Gradually the swimmer can increase the amount of exercise and try to complete his schedule more rapidly. Other combinations of movements will suggest themselves and can be worked into the routine which, followed two or three days a week for several months, will do much towards advancing the swimmer to better condition.

This is also the time to eliminate defects and make any major alterations in the stroke that seem necessary. The tubes and boards will be useful to strengthen a weak pull or kick. The rule book can be studied for its definition of the correct breast-stroke and backstroke movements, and for information as to what is legal and illegal in turning. The competitor who learns the causes of disqualification may protect himself against this heartbreaking way of losing a race. The judges are eagle-eyed, and they know their business well. Let a breast stroker slip in a few scissor kicks, let a backstroker roll onto his side as he reaches for the turn, let a free styler fail to touch with his hand before turning to push off, and bad news will be waiting for him when he finishes.

A month or two before the first meet, formal practice begins, and the swimmer swings into a training schedule of distance swimming, sprints, work with the tube and board and races that eventually should bring him to the peak of his ability near the end of the season. This is four months away, and progress need not be rapid. On the first

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day of practice he may swim no more than usual, but he will find himself working harder, especially if he is out for a team.

The potential competitor is swimming with others now, and he has a good chance to gauge his relative ability. A number of his fellows will be far ahead of the others both in skill and in conditioning, and he may have the disheartening experience of seeing the froth of someone else's kick. He need not be discouraged. The coach is not interested in speed and will indicate as much by telling the swimmers not to race one another. Nor will he favor the more experienced and more outstanding men. No coach can guess at this time of the season who will be on his team and who will not. Realizing that there may be a number of potential greats in that throng of splashers, he will divide his attention evenly among all of them. The dreaded "cut" which sends a hopeful back to the junior varsity, intramural, or "second" team will not take place for a month or more.

The first week will probably be grueling, for the candidate is not yet in condition. This is as it should be. Unless he feels a strain on muscles, lungs, and body in general, he is not getting enough work. Gradually, however, the strain will become less, the lungs will cease complaining, the body will take on a new strength and vigor.

The swimmers will quickly be trained to the point where a thousand yards a day, or forty laps in a seventy-five-foot pool, can easily be covered at about half-speed. There will be but little sprinting, although now and then at the end of the practice session a twenty-five-yard dash will give the swimmer a taste of speed. Special work on the legs and arms with the various artificial aids will be

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continued. If possible, practice should be twice daily: one session in the morning, focused on a long swim of about a mile; the other in the afternoon, on shorter swims. More and more practice will be on a competitive basis. This is accomplished by dividing the swimmers into groups of relatively equal ability and sending them through ten, twenty, thirty laps or whatever it may be at half-speed with a sprint for the two to four laps at the end.

The following schedule is suggested as a basis for early-season training in which only one practice session a day is held. If there are two, the other can be devoted to distances.

MONDAY, WEDNESDAY, AND FRIDAY

Distance free stylers: 500 to 1500 yards each day. Practice turns. 200 to 250 yards at a good pace. Practice kick with boards for from 250 to 400 yards and arm stroke with tubes for about 250 yards.

Sprinters: 500 yards. Turns and a few fast starts. Kicking boards and pulling tubes same as above. Perhaps 150 or 200 yards at a fast pace.

Backstrokers: 1000 yards. 200 yards at medium speed. Turns. Some kicking without use of the arms.

Breast strokers: 1000 yards. 250 to 300 yards at medium speed. Turns and starts. Practice kicking with use of boards.

TUESDAY, THURSDAY, AND SATURDAY

Distance free stylers: Three shorter swims of about 750, 500, and 250 yards respectively—fairly fast.

Sprinters: Shorter distance than on previous day. Between 200 and 500 yards. Then, a few 100-yard dashes at three-quarters speed.

Backstrokers: Three swims of about 250 yards each. Sprint last 75 yards in one of them.

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*Breast stroke*s: Three swims of from 200 to 500 yards each, sprinting last 50 to 75 yards in one of them.

This is merely a basic plan subject to many variations according to the condition of the individual. Although swimming is not at top speed, the turns should be executed rapidly, and every stroke and kick should be full and strong.

Later, this routine will have to be changed to include the various events of the first meet. Before meeting his first opponent, the competitor will swim the distance he will race a number of times. His chief task is to learn his "pace"—the distribution of his strength over a given distance so that he swims it at maximum speed. A swimmer does not start at top speed and continue until he falters to the finish like a mechanical toy when the spring runs down. Sprinters alone can cut loose all their power from start to finish; for distances over a hundred yards a pace is essential that will carry the swimmer through the race and permit a strong last lap. A competitor who is in condition will generally finish with a small amount of reserve strength left, even when he breaks a record.

Pace is also the art of preserving coordination and form at any speed and under any conditions. The excitement of his first race can easily cause the swimmer to forsake his fine timing and to hurry his movements so that he thrashes the water ineffectively. Regardless of how fast he swims, the good competitor will stick to the same rhythmic timing. He will always make certain that the arms and legs are firmly gripping the water. No matter what the speed at which he covers a given distance, he will generally take

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about the same number of strokes. Even in those final exhausting few yards the swimmer will resist the temptation to "break" by shortening the pull or kick.

Pace can be learned by swimming the racing distance at a speed which will leave enough energy for sprinting the last fifty yards. This will teach the value of conserving energy and ingrain the habit of finishing strongly. Speed may gradually be increased throughout the distance until eventually it is about the same from start to finish. Pace may also be learned by swimming the distance at half-speed, then at three-quarters speed, then at full speed.

Before his first meet the candidate and his fellows will be timed. By comparison with the times of champions and of his opponents, he will then know how well he has progressed. Although the amount of practicing any swimmer should do under the critical judgment of the stop-watch is debatable, some is necessary.

Timing is a valuable ally in determining pace. By having a coach take his times at the quarter, halfway, and three-quarters marks as well as at the finish, and comparing the figures, the swimmer can tell whether he is swimming too fast or too slow in any part of his race.

A week before the first meet, the progress of the squad will have become too fast for many members, who should, when they drop out, be given a chance to swim with some lesser team. Races will have to be held to determine what two or more members are to represent the team in each event. Either indoors or outdoors, there are generally about eight events to each meet. The free style predominates, with distances ranging from fifty yards to a mile. There is generally one breast-stroke race for 200 yards or more, and a backstroke race for 150 yards or more. These are known

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as the specialty events. There is also a diving competition with required and optional dives, as well as two relay races, one for a backstroker, a breast stroker, and a free styler, the other for four free styler.

Four days before his first meet, when it has been decided that the swimmer shall be entered in one or more events, he becomes afflicted with nervousness. He will have difficulty concentrating on anything but swimming. How fast will he swim, and will his opponents be still faster? Will he make any mistakes? Will he swim in a straight line? How will it seem to swim with judges at the starts, turns, and finish, with timers holding their watches and with the critical crowd in the stands? These random thoughts may keep him awake at night and upset his digestion. He will probably feel that all this nervousness is undermining his condition.

Unless the nervousness markedly reduces his sleeping hours and really makes him ill, it is not affecting his condition; and the less attention paid it, the better. A certain amount of nervousness, especially on the day of the meet, is beneficial. It stores up energy in the body and has the competitor on his toes ready to pour it out in the race. Most boys are visibly tense and uncomfortable when they step onto the mark and await the gun; but, once they hit the water, this condition vanishes, their stomachs no longer feel unsteady, and they concentrate wholly on the race.

If nervous tension saps the strength and prevents relaxed swimming, the competitor can take steps that will at least reduce it to the point where it will no longer be a handicap to good performance. Whereas in the average swimmer nervousness is often due to lack of familiarity with the water, in the competitor it generally results from a sense of responsibility and a mistrust of his ability to per-

Competition

form well under pressure. After the first race, confidence should gradually increase, and in the long run experience may prove to be the best cure. The coach will have his own ideas for combating nervousness, and there are many stories of the great racing of boys or girls who have by one stratagem or another been relieved of this burdensome feeling of responsibility. One lad was so impressed with the fact that he was going to lose to a better opponent that his speed was dropping lower and lower, and something had to be done. The coach took him aside and, contrary to the usual procedure, advised him that his chances of winning actually were slim, but that this need not be of concern because everyone has to lose at some time. Furthermore, the coach stressed the fact that the team could win without his earning first-place points in this race. Of course this negative psychology would not be successful on most persons; but in this case it worked wonders. Relieved of the responsibility of winning, the boy took a strong lead and swam one of his best races of the season.

The swimmer is generally his own best doctor in this matter. He can convince himself that he will not make mistakes by carefully reviewing starts, turns, and strokes in practice. So that he will not be too tense on the mark, he can fix his eye on the far end of the pool and, while slowly reviewing in his mind just how he will swim this race, await the sound of the gun.

When he hits the water the sense of being in a strange new world comes back to him which he had the first day he went paddling. Froth boils about his face, and blotches of foam on each side of him mark his rivals, and never throughout the race does he have an exact knowledge of their relative positions. This is the time when the care with

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which the swimmer mastered his stroke and developed a sound pace will tell. With all the disturbances of the race to distract him, his movements should still be controlled and effective. Whether his rival is close beside him or out of sight, he should still be able to maintain his best form. And when he wheels for the final dash home, his opponents on each side literally matching strokes with him, he should be able to exert that extra ounce of effort needed to win and still maintain a full, even stroke.

Swimmers generally do not have to be told of the value of keeping in training. The practice sessions are so strenuous that anyone who breaks the rules will be extremely unhappy when he swims a mile or more the next day. Furthermore, any deviation from normal ways of living will immediately be recorded on the swimmer's time chart. Alcohol, cigarettes, lack of sleep, and, it might be added, overeating, will make practice—in which the swimmer is covering close to two miles a day—rather distressing.

It is not that training rules for swimming need be particularly exacting. Actually, the swimmer can live about as he pleases if he can stand the strain of hard practice. Most swimmers cannot, however, and must simply vary their daily habits to the extent of emphasizing the more healthful aspects. They will naturally seek more sleep because constant immersion day after day burns a lot of energy and makes the body somewhat sluggish. Although it is possible that diets can be carefully prepared which will in the long run improve stamina, the average competitor is not very particular about what he eats. He should not overeat, because this shortens the wind and tends to slow his swimming generally. On the other hand, unless he is overweight he need not avoid hearty foods. Most

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swimmers' bodies develop a thin layer of fatty tissue—hardly noticeable—as a protection against the chill of the water, and this is more helpful than harmful because it increases buoyancy. The swimmer's training food is not the kind you would feed an athlete who has to keep his weight down. Daily practice sessions will tend to normalize the weight. Such simple foods as lamb chops, steak, roast beef, baked potatoes, milk, toast, pudding, fruits, and ice cream are all acceptable. Fried foods and heavy foods such as pastry should be avoided.

A schedule for the middle of the season is about as follows:

MONDAY

Distance work in the morning—if possible. In the regular afternoon practice, 500 yards for distance men, 250 for sprinters. Smooth out starts and turns, and correct any mistakes made in the last meet. Distance men will go through their racing distance once at half-speed and will sprint a couple of laps. Sprinters will swim 200 yards and perhaps go through their distance once.

*Breast stroke*s: 500 yards. 250 yards practice on starts and turns, and their racing distance once. *Backstroke*s, the same.

TUESDAY

Distance men: 750 yards and their regular distance, at full speed. Form a relay, and swim a series of 50-yard sprints.

Sprinters: 200 or 250 yards. 50 or 100 yards at full speed. Form a relay, and do a series of 50-yard sprints.

*Breast stroke*s: 250 yards; race distance; series of sprints.

*Backstroke*s: 200 yards; race distance; sprints.

WEDNESDAY

Like Monday.

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THURSDAY

All men swim a few laps more than their usual distance very easily. Races and time trials in each event. The men swim their distances twice, fast the first time, slower the second. Wind up practice with easy swims. Practice a few trial starts with a gun.

Some coaches prefer to conduct this strenuous practice session on Wednesday and ease off on Thursday.

FRIDAY

An easy session for most of the competitors, races only for those who the coach thinks can stand it.

SATURDAY

Generally, the day of the meet. No competitors in the pool until just before the meet starts, when each man swims a few lengths to relax and "get wet."

Even more than the first, this schedule is extremely tentative. By now the competitor is in excellent condition, swimming strongly and well, and he is going to find it increasingly difficult to improve his time. His practice should be as individualized as possible. He may need more or less work than his companions—it depends upon his own and the coach's judgment to decide which. Sometimes in mid-season his speed becomes perceptibly slower, he feels weaker and less able in the water, although the immediate cause of this slump will not be apparent. Possibly he has had too much swimming, in which case a three- or four-day layoff from regular practice, with plenty of sleep and long walks, may start him on the upgrade again. It may be that he has not had enough work, in which case he

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should be made to race against the stop-watch for all kinds of distances. Sometimes the midseason slump may be purely mental: the swimmer has decided that he can progress no further, that he has reached his "peak."

This is the time to examine every phase of his swimming to see if a minor change here or there will not save a few seconds. Perhaps his turns can be made faster. Swimmers tend to neglect their turns despite the fact that these are often the difference between races won and lost. A fraction of a second saved on each turn may mean a whole second saved by the end of the race, and seconds are valuable in competition. Long, fast push-offs are especially essential. They have a definite psychological value, for they can send a swimmer into the lead on each turn, forcing his competitors to swim faster to overtake him. This is not only tiring physically but discouraging mentally to the hard-working opponent.

Starts have a similar importance. No great time saving can be effected by the fastest racing dive, but again the competitor who finds himself in the lead has a definite advantage over his opponents. In the short dashes, the finish of the race often depends upon the start. Many a swimmer has won by getting off the mark a little faster than his opponent and maintaining that early lead throughout the distance. The adoption of the so-called "dead" start in which the starter tells the swimmers to "take their marks" and then, when they are ready, fires the gun has made "jumping the gun" or "stealing" almost impossible; but it has not prevented, and was not intended to prevent, the swimmers with the sharp reflexes and springy legs from getting off a little quicker than their fellows.

The backstroke start from a position in the water, hang-

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ing onto the side of the pool, does not lend itself to experimentation; but the long under-water breast-stroke start does. Swimmers with good lungs and a fast under-water stroke will cover twenty-five yards or more before coming to the surface—and often with excellent results. For those who can breast-stroke faster below the surface than on top, and who do not find it too fatiguing to hold their breath, this type of start will be definitely advantageous. Some breast stokers are poor under-water swimmers, however, and should come to the surface immediately. Good butterfly stroke swimmers may be so much faster on the surface that it is better for them to avoid under-water swimming also.

How much or how little breathing he needs to do while swimming will have to be decided by each individual competitor. Thus, the breast stoker whose stroke may be slower because of the breathing, should stay under water as much as possible both on starts and on turns. Most free stylers find that their stroke is most efficient when they breathe on every stroke; yet sometimes a fraction of a second can be saved in the sprints if the swimmer drives through his fifty or a hundred yards with as few breaths as possible.

Because the most important meets occur at the end of the season, that is the time the competitor should be at his best. The midseason slump has been avoided, and every little detail of his stroke polished so that his time continues to fall. He may have reached the point, however, where practice no longer brings improvement. He is already in the best possible condition. By piling more and more into each day's practice session, he can now do more harm than good. Too much immersion often makes for

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mental and physical sluggishness, saps the energy, and causes loss of interest. This is the time to stabilize the conditioning work at the point where it seems to be doing the most good.

Practice should be more fun than ever now that everyone is in condition. Often a brief water game at the end of practice will relieve some of the pressure and keep the team in good spirits. Gradually throughout the season team morale has been developing, and now it is at its best with each swimmer feeling his responsibility for the team's success. Morale is the indefinable feeling the members of a team often develop, and which will sometimes lift them to great heights. Once in a while a contagious sense of impending success will catch a team, and each and every man will perform in superhuman fashion in a single meet. This is the high point of the season, it is one of the grand experiences of competition.

But the last meet of the season is over, and the swimmer has a few months of idleness ahead of him. What will he do for a sport? What will he become interested in now? If you are wise in the way of swimmers and look for him in the right place, you will find him enjoying long, easy, relaxed swims. The pressure of competition is gone, and its thrills too; but the pleasure of swimming remains. Like any complete swimmer, the competitor likes swimming purely for itself. For him, it is a year-round sport.

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